June 27, 1918.

MEMORANDUM
SUMMARY OF IMPORTANT PLANS AND ACTIVITIES
OF THE DEPARTMENT OF AGRICULTURE
1913 - 1918

That the United States Department of Agriculture, described not long ago by President Wilson as "the greatest practical and scientific agricultural organization in the world", was prepared for the great work which fell to it on the declaration of a state of war with Germany, April 6, 1917, was due in large measure to the generous and constructive Federal Legislation in its behalf during the preceding four years.

Agriculturally America was prepared for war. So generously had the American people supported agricultural legislation and development, and so thorough was the organization of the Federal and State agricultural forces that three days after war was declared representatives of these agencies headed by the Secretary of Agriculture, sat in a conference at St. Louis and drew up a program of food production and conservation, the wisdom of which has not been generally or successfully questioned and the substantial part of which four months later had been enacted into law. It is doubtful if the efficiency thus demonstrated has been equalled by any other country.

LEGISLATION

The following legislative enactments of the preceding four years, which since have been supplemented by other notable agricultural war measures also described briefly below, made possible, to a considerable extent, the immediate mobilization of American agriculture.

(1) The Cooperative Agricultural Extension act of May 8, 1914 known as the Smith-Lever act appropriated $480,000 outright for the first year, $600,000 the second year and an increase of $500,000 annually thereafter until 1922-23 with the requirement that the States make available an equal amount. For 1922-23 and annually thereafter the Federal government will

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appropriate $4,500,000 annually which with the States duplicating all amounts above $10,000 a year, will make a total of $8,680,000 a year available. The object of this act is to take directly and effectively to the farmer on his farm the information resulting from the activities of the Department and of the State Agricultural Colleges and to induce him to apply it. The marked success and the far-reaching effect of this legislation, described by Secretary Houston as one of the most striking educational meansures ever adopted by any Government, is set forth elsewhere under the report of the States Relations Service, which administers the act.

(2) The Cotton Futures Act of August 18, 1914, reenacted with amendments in the agricultural appropriation act for the fiscal year 1917, has resulted in the establishment of definite standards for cotton, has made possible the supervision of the operations of the futures exchanges, and has placed cotton trading on a sounder basis. The report of work done by the Bureau of Markets which administers this act, found on page 24, deals more specifically with results obtained under it.

(3) The United States Grain Standards Act, which was included in the agricultural appropriation act for the fiscal year 1917 and 1918, is bringing about uniformity in grading, is enabling the farmer to obtain a fairer price for his product and to improve its quality, and is preventing or diminishing materially the shipment of adulterated grain. A more detailed report of the working of this act is contained in the report (page 25) from the Bureau of Markets which administers it.

(4) The United States Warehouse Act, also included in the agricultural appropriation act for 1917 and 1918, authorizes the Department of Agriculture to license bonded warehouses which handle certain agricultural products. It makes possible the issuance of reliable and easily negotiable

appropriate $4,500,000 annually which with the States supplying all amounts above $10,000 a year, will make a total of $20,000,000 a year available. The object of this act is to take directly and effectively to the farmer on his farm the information resulting from the activities of the Department and of the State Agricultural Colleges and to induce him to apply it. The marked success and the far-reaching effect of this legislation, described by Secretary Houston as one of the most striking educational measures ever adopted by any Government, is set forth elsewhere under the report of the Extension Service, which administers the act.

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warehouse receipts, promotes the better storing of farm products and encourages the standardizing of storages and of marketing processes. For more detailed report of work under the act see report of Bureau of Markets, page 25.

(5) The Federal Farm Loan Act was approved July 17, 1916. It creates a banking system which reaches intimately into the rural districts, operates on terms suited to the farmer's needs under sympathetic management, introduces business methods into farm finances, brings order out of chaos, reduces the cost of handling farm loans, places upon the market mortgages which are a safe investment for private funds, attracts into agricultural operations a fair share of the capital of the Nation, and reduces interest.

(6) A provision in the Federal Reserve Act, approved December 23, 1913, authorized national banks to lend money on farm mortgages and recognized the peculiar needs of the farmer by giving his paper a maturity period of six months.

(7) The Federal Aid Road Act approved July 11, 1916, provides for cooperation between the Federal Government and the States in the construction of rural post roads and of roads and trails within or partly within the National Forests. It has conduced to the establishment of a more effective highway machinery in each State, strongly influenced the development of good road building along right lines, stimulated larger production and better marketing, promoted a fuller and more attractive rural life, added greatly to the convenience and economic welfare of all the people, and strengthened the national foundations. It appropriates from the Federal treasury the following amounts to be expended in cooperation with the States in the construction and improvement of rural post roads; For the fiscal year 1917, $5,000,000;

1918, $10,000,000; 1919, $15,000,000; 1920, $20,000,000; 1921, $25,000,000; total, $75,000,000. As the States are required to make available at least an equal amount or its equivalent in labor and materials, there will be available not less than $150,000,000 for cooperative construction work extending over a period of five years.

(8) The Food Control Act of August 10, 1917, vesting in the President regulatory powers, in considerable part of a commercial nature, to be exercised through an emergency agency rather than through an existing department to deal with special and urgent national and international food problems growing out of the war. The provisions of the Food Control Act so far as they relate to food and feedstuffs are executed by the Food Administrator.

(9) The Food Production Act of August 10, 1917, an act "to provide further for the national security and defense by stimulating agriculture and facilitating the distribution of agricultural products", is administered by the Department of Agriculture and carries an appropriation of $11,346,400 for the following purposes:

1. The prevention, control, and eradication of the diseases and pests of live stock; the enlargement of live-stock production; and the conservation and utilization of meat, poultry, dairy, and other animal products, $885,000.

2. Procuring, storing, and furnishing seeds for cash at cost to farmers in restricted areas where emergency conditions prevail, $2,500,000.

3. The prevention, control and eradication of insects and plant diseases injurious to agriculture, and the conservation and utilization of plant products, $441,000.

4. The further development of the Extension Service which is conducted in cooperation with the agricultural colleges in the various States, $4,348,400.

5. Surveys of the food supply of the United States, gathering and disseminating information concerning farm products, extending and enlarging the market news services, preventing waste of food in storage, in transit, or held for sale, giving advice concerning the market movement or distribution of perishable products, and investigating and certifying to shippers the condition as to soundness of fruits, vegetables, and other food products received at important central markets, $2,522,000.

6. The development of the information work of the Department, enlarging the facilities for dealing with the farm-labor problem, and extending the work of the Bureaus of Crop Estimates, Chemistry and Biological Survey, $650,000.

(10) With an appropriation of $10,000,000 contained in the Food Control Act, the War Industries Board purchased 120,000 tons of nitrate of soda for fertilizer use and the Department of Agriculture is selling it to farmers for cash at cost.

(11) Congress made available $200,000,000 to facilitate the operations of the Farm Loan Board because of the unusual demands on funds which otherwise might have been invested more freely in such bonds.

(12) Congress appropriated $4,000,000 in addition to the $2,500,000 in the Food Production Act, for the purchase and sale of seed to farmers for cash at cost.

(13) Under the powers given in the Food Control Act, there has been placed under license and control by the Department of Agriculture -

(a) The ammonia industry
(b) The fertilizer industry
(c) The farm equipment industry
(d) The stockyards industry.

(14) Under the Selective Service law -

(a) Skilled farm labor has been given deferred classification, being placed in Class II.

(b) Assistant and associate managers of necessary agricultural enterprises have been given deferred classification, being placed in Class III.

(c) Heads of necessary agricultural enterprises have been given deferred classification, being placed in Class IV.

(d) In order to prevent the possibility of a failure of leaders in the agricultural field, provision has been made for a reserve from the first-third of agricultural seniors in the agricultural colleges.

(15) The Secretary of War requested Congress to give him authority to furlough farmers in the National Army in order that they might return to their farms for certain periods if military conditions permitted it. The Congress granted the authority.

STATES RELATIONS SERVICE

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1. Administers the cooperative agricultural extension act, providing for close cooperation between the Department of Agriculture and the agricultural colleges in making information available to farmers.

   (a) This act, also known as the Smith-Lever Act, passed and developed under the present administration, has made more effective the other acts establishing and maintaining the Department of Agriculture, and the State experiment stations.

   (b) Through its operations the Department of Agriculture and the agricultural colleges have established the broadest and most far-reaching system of popular education, based on practical knowledge and scientific research, which has yet been devised.

   (c) Through personal agents and cooperating farm people, as well as through the printed page, the results of experience and research in agriculture and home economics are being carried virtually to every farm and into every farm home in the land.

   (d) Total funds available for extension work from State and Federal sources have increased from $3,600,000 in 1914-15 when the Department began to cooperate with the State agricultural colleges under the provisions of the act to $15,000,000 -- estimated funds available during the coming fiscal year.

   (e) Total forces engaged in cooperative agricultural extension work have increased from 2,600 in 1914-15 to approximately 6,000 at the present time.

      1. Number of counties having services of a county agent July 1, 1914, 1,140; now, 2,500

      2. Number of counties having services of home demonstration agent July 1, 1914, 280; now, 1,680.

2. The extension system attains its ends in four principal ways:

   (a) Through practical demonstrations on the farms and in the homes;

   (b) Through visual and oral instruction in movable schools and meetings;

(c) Through boys' and girls' clubs; and

(d) Through the organization of farm men and women in farm bureaus, community clubs, etc., to do for themselves many things which improve agriculture, home life, and community activities.

3. Conceived wholly for peace conditions, this organization is proving to be the greatest single agency in speeding up war work in agriculture and home economics. Under the special provisions of the food production act

(a) Extension organization and work in the rural communities have been greatly increased.

(b) Home demonstration agents have been located in the cities and have already given instruction in the best methods of conserving and utilizing the food supply to large numbers of people. They are also beginning to serve as useful mediums for bringing city and country people into more sympathetic and helpful relations -- a function which may easily be developed on a large scale in the future.

(c) The organized and combined cooperative efforts of specialists, county agents, farm bureaus, and extension workers from the State colleges and the Department have been largely responsible for the increase in food production.

1. The Federal war program, as far as agriculture is concerned, was based largely on reports that came through this great organization to Washington.

2. Plans were made, then put into effect, down to the quickening into productive action of the smallest rural communities.

3. Thus was brought about increased acreage of staple crops, multiplication of home gardens in country and town, and the canning, drying and preserving of perishable surplus crops.

(d) Has helped organize farm labor supplies, and within individual States has made accurate surveys of all agricultural supplies and needs with a resultant intelligence in the movement of labor, seeds and stock, and the bringing together of the agricultural buyer and seller.

4. Through institutes and other meetings 3,000,000 farmers are reached annually by Federal and State extension forces.

5. Through demonstrations and other work of the county agents an additional 3,000,000 farmers were reached last year as follows:

   (a) In the 15 Southern States 1,600,000 -- more than half the farmers.

   (b) In the 33 Northern and Western States 1,400,000.

6. In the Southern States the Department has definite data regarding the number of farmers reached directly by its agents only for the last three years. These records show that

   (a) Demonstrations in cotton increased from 20,245 to 41,379;

   (b) Demonstrations in corn increased from 56,567 to 75,817;

   (c) Demonstrations in alfalfa increased from 3,209 to 6,316;

   (d) Demonstrations in crimson clover increased from 3,915 to 5,573;

   (e) Total number of demonstrations in non-leguminous, hay, forage, and cover crops increased from 10,042 to 25,958;

   (f) Demonstrations in feeding hogs increased from 885 to 3,041;

   (g) The number of herds of swine started, due to the activities of the agents, increased from 4,451 to 11,301;

   (h) The number of various kinds of live stock treated at the suggestion of the agents increased from 1,736,823 to 3,297,872;

   (i) The number of community or farmers' clubs organized increased from 1,712 to 3,507, and the membership from 44,548 to 113,316.

7. The results of these demonstrations become very apparent when comparison is made between the production in 1913 and that in 1917. These data exemplify how thoroughly the southern farmers have taken the advice of the agents of the Department to maintain the acreage in cotton, if possible, and increase the production of food and feed crops. The year 1917 was the first that the South has been practically able to feed itself. During these years the records show, for examples, that

   (a) The number of bushels of corn increased from 658,252,000 to 682,643,000;

(b) The number of bushels of wheat increased from 51,009,000 to 74,857,000, or approximately 50 per cent;

(c) The number of bushels of oats increased from 97,237,000 to 120,613,000, an increase of approximately 25 per cent;

(d) The number of tons of hay increased from 4,214,000 to 6,510,000, an increase of over 50 per cent;

(e) The number of bushels of white potatoes increased from 17,798,000 to 27,987,000;

(f) The number of bushels of sweet potatoes increased from 47,055,000 to 72,870,000.

8. In the Northern and Western States, where the work is relatively new, the extension agents are having a marked influence upon the agriculture in the counties where they are located. The records show, for examples, that

(a) During 1917 they assisted approximately 125,000 farmers in securing better seed, and it is estimated that this increased the production of those farmers by at least 35,000,000 bushels.

(b) During 1917, as a result of special campaigns, they were able to increase the number of live stock of farmers by 43,405 head of cattle, 130,125 head of swine, 148,211 head of sheep, and 327,095 head of poultry.

(c) Seven hundred and fifty-six farmers were aided in securing tractors, with the result that they increased their production 105,000 acres.

(d) As a result of a special campaign to use selected corn, 64,000 farmers planted 1,300,000 acres with selected seed; 24,000 farmers planted 100,000 acres of potatoes with seed which were treated for a disease; and 60,000 farmers planted 1,120,000 acres of oats treated for smut.

9. The work of the nearly 1,900 home demonstration agents is quite as varied as that of the county agents. It includes

(a) Demonstrations in food conservation, particularly canning and drying in the summer;

(b) Demonstrations in poultry raising, egg marketing, butter making, preparation of food for the table, bread making;

(c) Encouraging the use of homemade labor-saving devices;

(d) Aid in establishing rest rooms for farm women in towns;

(e) Aid in establishing community canning and drying enterprises;

(f) Instruction in the conservation of clothing, fuel, health, and income.

10. As an example of the work done among women and girls last year, the canning effort may be cited. Federal and State leaders taught 1,900,000 women and girls to can and dry vegetables and fruits. The girls under instruction canned over 14,000,000 containers and the women more than 35,000,000 containers. At the minimum wholesale price of these products their value aggregated more than $10,000,000.

11. Home demonstration work has been established in cities in the last year with most encouraging results. The activities of such agents have included

(a) Food demonstrations;

(b) Training for volunteers;

(c) Preparing store window and other exhibits;

(d) Helping to organize community canning kitchens, war kitchens, and Liberty bread shops;

(e) Cooperation with home economics teachers;

(f) Training grade teachers for volunteer work;

(g) Arranging meetings for foreign-born women in homes and settlements;

(h) Working with retail and wholesale food dealers;

(i) Advising with army cooks in near-by cantonments.

12. In boys' and girls' club work the youth of the country has been interested and trained in better agriculture and in home making.

(a) More than 800,000 boys and girls in the Northern and Western States were enrolled in food-producing and industrial clubs last year. An idea of the contribution which the club workers made to the Nation's food supply may be gained from the reports of 160,000 who sent in returns from their work. These reports show a production of 458,873 bushels of corn, 325,786 bushels of potatoes, 126,460 pounds of beans, 203,383 pounds of grain sorghum, garden produce valued at $1,000,000, 217,160 jars of jellies, 1,578,510 quarts of fruits, vegetables, meats and soups, 28,864 tons of sugar beets, 106,358 chicks, 35,370 dozens of eggs, 10,583 hogs, 415 baby beeves, 178 sheep, 599

calves, 346,698 loaves of bread, and other products. Other clubs of smaller enrollment included onion clubs, butter clubs, cow-tested and dairy record clubs, sweet-corn clubs, wheat clubs, and home-yard clubs. The value of food produced per individaul member was $21.89, while the cost of the club work was only 74 cents a member.

(b) In the South, 115,745 boys were enrolled in regular clubs, while probably 400,000 were reached and helped in food and feed production through instructions given by agents in schools and community clubs, demonstrations and so on. It is estimated that the value of food and feed produced by the regular members last year was $4,486,900. Corn produced by the regular club members totaled 1,135,516 bushels; peanuts, 102,688 bushels; potatoes, 67,858 bushels; grain sorghum, 38,756 bushels; wheat, 1,080 bushels; oats, 3,737 bushels; peas, 6,717 bushels; beans, 6,233 bushels; hay, 2,171,000 pounds; pork, 2,437,970 pounds; beef, 164,064 pounds; poultry, 135,667 fowls; pigs (breeding project), 37,101; dairy calves, 1,586; sheep, 183; cotton valued at $109,972; production of four-crop clubs (Georgia alone) valued at $56,800; miscellaneous products valued at $49,401. Negro boys in the "farm-makers" clubs produced material worth $61,077.

BUREAU OF PLANT INDUSTRY

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1. In general has aided farmers in every section of the country to increase production by

   (a) Development of new cultural methods;

   (b) Introduction of new crops and improved varieties of existing crops;

   (c) Combating the destructive plant diseases.

2. Through its seeds stocks committee is furnishing tested seed corn to farmers of the great corn States. Seed has been sold at cost for cash to farmers while reserve stocks have been placed in all States north of the Ohio River. This work made necessary by the poor quality of much of the seed corn and a shortage which threatened a great decrease in this important war-time crop, was done under special appropriations amounting to $6,500,000 provided by Congress. Under the same plan has furnished seed of other plants in other sections where shortages threatened.

3. Developed in cooperation with other bureaus of the Department and with State agricultural representatives, a war food production program for the nation, the definite recommendations of which were carefully determined and were calculated to maintain a well balanced agriculture during war time.

4. Has undertaken an intensive campaign to eradicate the common barberry, which harbors black or stem rust of wheat and other cereals in the States of Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Nebraska, North Dakota, South Dakota, Montana and Wyoming.

5. Has conducted since 1915 a successful campaign of eradication of citrus canker, a serious disease in the Gulf States -- the first instance of the use of Federal funds appropriated specifically for the eradication of a plant disease. Canker has been practically eradicated from Florida and South Carolina.

6. Has conducted since September 1, 1917, in cereal-producing States a campaign against the destructive smuts of cereal crops. It consists in instruction and natural demonstration of seed treatment and in getting farmers and school boys to perform experiments of seed treatment under supervision of an instructor.

7. Developed varieties of cotton suited to the irrigated sections of the Southwest and established a cotton industry in that region now aggregating 150,000 acres. Some 50,000 acres are devoted to the production of American Egyptian cotton, a high-grade,

long-staple type formerly imported from Egypt.

8. In 1915 and 1916 arranged for the importation of sugar-beet seed in time for planting.

9. In 1915, through the State Department, obviated interference with imports from Mexico of binder twine needed for handling the huge grain crop then coming to harvest.

10. Aided the hemp and flax industries by development and introduction of better varieties for fiber purposes.

11. Made possible larger yields and better grades of corn by work with the Southern Pacific strain which now can be grown over a wide territory.

12. Developed three new hardy varieties of spineless cactus to provide forage in the dry regions of the Southern Plains.

13. Developed better methods of storing, packing, and shipping fruit, especially apples, in the East and Northwest, saving tremendous losses in long-distance shipments.

14. Improved methods of shipping table grapes from California and oranges from Florida.

15. Introduced many new types of plants.

16. Encouraged the home-gardening movement, estimated to have meant from 200 to 300 per cent more gardens in 1917.

17. During the fiscal year 1917 distributed nearly 16,000,000 packages of vegetables and flower seed.

18. Studies of the improvement of citrus orchards through the use of only productive trees of good quality as sources for bud wood, have confirmed the earlier recommendations. Practically all of the citrus nurseries are now propagating their nursery stock from selected parent trees.

19. Under special appropriation by Congress in 1916 distributed seeds to provide food for 21,000 distitute families and feed for their animals in the flood areas of North Carolina, South Carolina, Georgia, Alabama, Florida, Tennessee, and Mississippi.

20. Several improved varieties of cotton developed by the Department continue to increase in usefulness and popular favor. Among these is a variety known as Meade, which has lint scarcely distinguishable in texture and length of fiber from that of the Sea Island of Georgia and Florida. The fact that it is earlier than Sea Island is likely to make practicable its substitution

for Sea Island in regions of boll weevil infestation.

21. Rhodes grass, recently introduced by the bureau, has grown rapidly in popularity in Florida and Southern Texas. In the latter State very large areas of land, both irrigated and non-irrigated, have been planted to this grass. Both for hay and for pasturage it has proved far superior in Southern Texas to any other plant.

22. Sudan grass, introduced by the Department and first distributed in 1912, has proved remarkably successful as a hay crop in the Middle and Southwestern States, and the acreage now planted is very large.

23. Tests of the Chinese dry-land elm (Ulmus pumila) carried on at Mandan, North Dakota, have shown this tree to be exceptionally well adapted both to the climatic and soil conditions of this region, and it is believed that this species will become a valuable shelter-belt and ornamental tree for the northern plains regions.

BUREAU OF ENTOMOLOGY

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1. In general the work of the Bureau of Entomology consists in

   (a) Investigations of the life histories and habits of insects injurious and beneficial to agriculture, horticulture and other crops and products, forest and shade trees;

   (b) Investigations of insects affecting the health of man and domestic animals;

   (c) Ascertaining the best means of destroying injurious insects;

   (d) Work in systematic entomology and other phases of the general science.

2. Prevented large losses to the wheat crop of 1915 by foreseeing the great wave of Hessian-fly infestation which spread over the wheat belt by distributing broadcast warnings and definite information on how best to avoid the ravages of the pest.

3. Investigations have resulted in complete success in adjusting and applying poison baits for the destruction of injurious grasshoppers, effecting a saving of many thousands of dollars by the protection of forage crops.

4. By means of proper preparation and application of baits against cutworms, forage crops, particularly alfalfa, have been saved to the extent of many thousands of dollars;

5. Developed control measures for the potato tuber moth in the Pacific Coast States by which losses from this insect have been greatly reduced.

6. Developed remedies for the most important enemies of the sugar beet, including wireworms, webworms and so on with material benefit to the industry.

7. Developed and demonstrated satisfactory control of the onion thrips.

8. Determined remedial measures for protection of truck crops from cutworms.

9. Established, with marked success, colonies of ladybird beetles, the enemies of plant lice.

10. Developed the use of powdered arsenate of lead as a satisfactory dry poison for tobacco horn worms, cotton worms and other insects.

11. Perfected measures for the mitigation of the boll wevil of cotton, which work has influenced to an important extent agricultural pratices in the South.

12. Progress has been made in the development of control methods for the sugar-cane borer.

13. Marked success has followed efforts to retard the spread of the gipsy moth.

    (a) The area infested in 1914 -- 18,633 square miles -- has been held to an area of 21,998 square miles for 1918.

    (b) Numerous parasites and predatory enemies of the gipsy and brown-tail moths, introduced from various parts of the world, already have proved to be factors of great importance in the control of these insects.

14. Developed effective measures for the control of citrus-scale pests and the orange white fly in Florida by the use of appropriate sprays.

15. Perfected a spraying schedule for orange groves, which is now in large use by growers.

16. Has made improvement in the utilization of hydrocyanic-acid gas for the control of mealy bugs and other scale insect pests in citrus orchards of southern California.

17. Has accumulated information on the Mediterranean and other fruit flies in Hawaii and elsewhere, which will be of the greatest value to fruit growers of the United States should these insects ever become established in this country.

18. Determined effective and satisfactory control of the grape-berry moth and recommended a spray schedule to grape growers.

19. Developed remedies for many of the pecan insects in the South, resulting in material benefit to the pecan industry.

20. Investigations of the codling moth in different parts of the country have furnished a large amount of data which will be used in formulating a spray schedule effective under the respective climatic and other conditions of the apple-growing regions.

21. Has conducted demonstrations on a large scale in the South to instruct farmers in the prevention of weevil injury to stored grains.

22. Has rendered assistance to mill men in the protection of mill products from insect attack.

23. Cooperates with the War Department to prevent insect damage to military supplies and stored products

24. Has conducted a Nation-wide campaign to increase honey production to help meet the shortage in the supply of sugar

25. Has worked out numerous problems of the beekeeper relating to the better care of bees during the winter, the utilization of adequate hives, and the detection and treatment of bee diseases.

26. Developed satisfactory treatment of manure to prevent fly breeding.

27. Demonstrated a new mosquito carrier of malaria.

28. In a specific study of the economic importance of malaria in the South and the losses to the planter resulting from invalidism due to this disease, it was learned that there was an annual loss of about $6 an acre attributable to malaria.

29. Developed methods by which Dendroctonus beetles, which constitute a serious menace to standing pine, spruce, and Douglas fir timbers of the Rocky Mountain and Pacific Slope States, have been shown to be controllable to a large degree.

    (a) The work done in the Yellowstone National Park during the last three years has resulted in almost complete eliminatiom of these beetles in yellow pine and sugar pine.

30. Operations carried out on Long Island, New York, against the hickory-bark beetle and the two-lined chestnut borer in oaks apparently have resulted in a great reduction in the numbers of these two pests, which are threatening the hickories and the oaks of this island.

31. Fifty specialists in 33 States cooperating with the State agricultural colleges are explaining and demonstrating to farmers, fruit growers, live-stock men, and others in various parts of the country methods of reducing insect losses.

32. The Bureau frequently is called upon to undertake special work in connection with the eradication or survey of recently introduced pests. It is now engaged in

    (a) Determining the distribution in the South of the sweet-potato weevil;

    (b) Ascertaining distribution and injuries of the Oriental peach moth;

    (c) Determining the distribution and injuries of the European corn-stalk borer;

    (d) Eradication of the Japenese beetle;

    (e) Eradication in Texas of the Pink bollworm;

BUREAU OF ANIMAL INDUSTRY.

1. In general, the major efforts of this bureau, intensified during the last year to meet war needs, have been directed toward

   (a) Stimulating the production of meat, dairy, and poultry products;

   (b) Utilization of these foods in the most economical ways;

   (c) Suppression of animal diseases causing an estimated loss of $212,000,000 annually;

   (d) Investigating the wisest use of available feedstuffs for live stock;

   (e) Encouraging the more general raising of farm animals.

2. Has conducted the Federal meat-inspection service, which not only protects the civilian population of this country from diseased or otherwise faulty meat and meat products, but guards the food of our soldiers and sailors. This service now covers at least 60 per cent of the meat and meat products produced in the United States at a cost to the public, per animal slaughtered, of about 5½ cents.

3. In 1914 eradicated within a comparatively brief period the most serious outbreak of the foot-and-mouth disease that ever appeared in this country -- a feat that in its magnitude was never duplicated by any other nation.

4. In 1916 and 1917 caused the early disappearance of another dreaded animal plague, vesicular stomatitis, which broke out among thousands of horses collected for exportation for military purposes.

5. Eradicated since March, 1913, the cattle fever tick from 211,598 square miles in Southern States, forcing a tick-free wedge to the Gulf of Mexico, enabling this immense area to begin to do its full share in meat production, and making a total of 379,312 square milesreleased from quarantine since the campaign began in 1906, which is over 52 per cent of the total area quarantined.

6. Freed since 1913, 586,757 square miles from sheep scabies and 246,013 square miles from cattle scabies.

7. Worked intensively for the control of hog cholera, the greatest impediment to hog production, in 611 counties of 33 States, saving

great sums to the swine industry and stimulating increased production. During last year the losses of swine were the lowest in 35 years.

8. Worked to minimize enormous losses from influenza or shipping fever among horses, especially among animals shipped for war purposes.

9. Sought a method of curing or preventing contagious abortion among cattle, under an appropriation allowed by Congress in 1917.

10. Is operating in 28 States under emergency funds to eradicate tuberculosis among cattle.

11. Conducted beef-cattle experiments and demonstrations as relating to economic methods of feeding and management and the utilization of such feeds as would make it possible to save grain.

12. Carried out extensive demonstrations of improved methods of cattle raising and dairying in the South as part of a program to encourage diversification in agriculture.

13. Worked for the development of cow-testing and cooperative bull associations in variousparts of the country.

14. Gave advice and assistance in the construction of thousands of silos and hundreds of barns.

15. Helped to develop better methods in the manufacture of butter and various kinds of cheese.

16. Aided more than 100 creameries to more efficient operation and utilization of by-products.

17. Cooperated with approximately 100 cities in improving their milk supply, and with the Public Health Service and the War and Navy Departments toward insuring safe and sanitary dairy products for army cantonments and naval stations.

18. Conducted active work to develop pig clubs among children, teaching 92,000 boys and girls in 26 States to raise pure-breds and demonstrating the value of pure-bred stock and proper care, feeding, and management of swine.

19. Encouraged poultry raising, especially in the South, through the organization of 15,000 children in 11 States as members of poultry clubs and stimulating poultry raising by general farmers and in urban back yards.

20. Organized campaigns for producing infertile eggs, thereby saving great loss from spoilage, and for culling out slacker hens from flocks.

21. Conducted special campaigns to enlarge the production of hogs and poultry, which yield quickest returns;

22. Advocated careful and intelligent feeding, to save food suitable for human beings and provide a use for products otherwise wasted;

23. Encouraged sheep raising for mutton and wool;

24. Made special efforts to increase beef production and aid breeders in procuring and placing breeding stock, with emphasis on the advantages to the general farmer of raising more animals;

25. Conducted campaigns for greater production and fuller utilization of milk and other dairy products, the cottage cheese propaganda being an example of how a largely wasted food, skim milk, can be made to play an important part to meet war-time needs.

WORK OF THE BUREAU OF MARKETS.

1. Originally established by the present Administration as the Office of Markets and Rural Organization to aid the half of American agriculture embraced in the marketing of farm products, rural finance, and rural organization, this office in 1917 has grown to such proportions that it was designated the Bureau of Markets. The aid this bureau has accorded to producer and consumer in the solution of problems in distribution and marketing has given it a most important part to play in war-time food problems.

2. Work is of three types:
   (a) Secures the facts as to the food supply, where it is and where it goes, and also as to the sources of textiles, particularly cotton and wool, so important in the present war.

   (b) Renders service by market news reports and market inspection service.

   (c) Enforces Federal laws as to cotton futures, grain standards, warehouse practices and standard containers.

3. Through its market news service on fruits and vegetables it has not only saved money to farmer and user, but has helped to conserve perishables by assuring their shipment to points where demands existed.

4. Encouraged and educated growers and shippers properly to grade and pack their products in order that they may be marketed economically and efficiently.

5. Determined and recommended specifications for United States grades for potatoes, Bermuda onions, strawberries, and tentative grades for apples, sweet potatoes and tomatoes.

   (a) The potato grades have been approved and promulgated by U. S. Food Administration, their use by licensed dealers being made compulsory.

   (b) The Federal Reserve Board also has authorized member banks to make loans against warehouse receipts for potatoes, properly graded, packed, stored and insured. Potatoes graded in accordance with the department's recommended grades meet these requirements.

6. Developed fixed and uniform standard containers for fruits and vegetables in order to facilitate the handling and marketing of these products, prevent loss in transit, and prevent fraudulent practices.

7. Devised and carried through nation-wide food surveys, the first stock-taking inventory of our Nation's supply.

8. Helped city governments in solving local marketing problems.

9. Aided in disposal of surplus products from war gardens.

10. Fostered marketing by parcel post.

11. Has given particular aid in marketing and creating a demand for dairy products.

12. Has helped in the establishment of public markets.

13. Aided cooperative organizations.

    (a) Gathered and made readily available information on cooperative rural credit associations, farmers' mutual insurance companies, and rural telephone organizations.

    (b) Helped in devising accounting methods and business practices for farmers' cooperative organizations such as creameries, fruit and vegetable growers' associations, grain elevators and the like. More than 1,000 grain elevators use the uniform accounting system that has been divised.

14. Has taken up rural organization questions, making studies of the best types of activities and offering suggestions for their creation or development elsewhere.

15. Issues market news reports covering all the more important crops with periodically-issued news services giving daily to quarterly returns.

    (a) Daily services on truck and fruits have helped buyers and sellers to agree on fair prices based on accurate knowledge of supplies and shipments.

    (b) Has helped the housewife to know what fruits and vegetables were being received in large quantities and which therefore were likely to be low in price. All this hashelped to equalize and stabilize prices and to affect in a similar way the flow of commodities.

    (c) The machinery of the Bureau is in active operation 24 hours every day, six days in the week. It adapts itself to the hours of the trade in the large cities and to the mail schedules of the specific rural communities where its representatives are located. It records actual facts and quotes actual prices, and in each phase of this service, it is excelling any service ever before rendered in the same field.

16. Has rendered similarly important service with its daily meat reports and the reports on cattle loaded for shipment, in transit, and received at principal markets.

    (a) Issues bi-weekly reports on honey and on grain and hay.

    (b) Monthly reports of stockyard receipts.

    (c) Monthly reports of seed stocks and of cold-storage holdings.

    (d) Quarterly reports of the wool supply.

    (e) All of these consitute the first comprehensive public information of this kind in this country. These news services are conducted by telegraph and over 15,000 miles of leased wires are used 12 hours in every 24. Over 1,000 railroad superintendents assist in this work by reporting daily by wire the number of cars and destinations of live stock, fruits and vegetables moving from their divisions.

17. Established the Food Products Inspection Service in 33 important central markets where shipments of fruits and vegetables are inspected by experienced, trained men.

    (a) Thousands of carloads of perishables over which there was controversy between grower, shipper, receiver or other interested parties have been inspected and adjustments made on the basis of the certificates of the Department, thus

        (1) Expediting the movement of these products into consumption.

        (2) Relieving congested transportation facilities.

        (3) Avoiding great waste of food which often has occurred in the past.

        (4) Saving thousands of dollars to interested parties from the grower to consumer.

18. In regulatory work has administered and enforced four important Federal statutes — the Cotton Futures Act, the Grain Standards Act, the Warehouse Act, and the Standard Container Act.

19. Under the United States Cotton Futures Act, standards have been established by the Department of Agriculture for twenty-one grades of cotton deliverable on future contracts.

    (a) Act provides for the determination of disputes by the Department of Agriculture for cotton delivered in cases where the complainants and respondents do not agree as to the grade of cotton offered for delivery.

(b) Received 1,400 disputes from the New York Cotton Exchange since the Act became effective in February, 1915.

(c) Last year there were less than half the disputes heard the preceding year in respect to cotton, and a still greater decrease in the number of bales involved.

(d) The cotton standards have been generally adopted by the cotton markets and by the trade not only in this country but abroad, notably by the Rotterdam Cotton Exchange.

20. Has taken up with the War Industries Board the question of the utilization of the low grades of cotton, of which a large surplus is accumulating.

21. Established, under the United States Grain Standards Act, official grain standards of the United States for shelled corn and for wheat.

(a) For the effective enforcement of the Act, the United States has been divided into thirty-five supervision districts, with an office of Federal Grain Supervision as headquarters for each District.

(b) Through the offices of Federal Grain Supervision, the inspection and grading of grain and the uniform application of the grades are carefully supervised.

(c) Has rendered much assistance to the members of the grain trade, to grain inspectors, and to the grain inspection departments with regard to the proper method of procedure employed in the sampling, testing, and grading of grain.

(d) New and improved laboratory equipment has been developed for work in determining the correct grade of grain and such equipment has been very generally adopted by the grain trade.

22. Much assistance and cooperation have been rendered the Food Administration, Grain Corporation and various branches of the War Department with respect to their problems having to do with grain inspection, grain transportation, and grain grading.

23. Under the Warehouse Act rules and regulations have been drawn up with the cooperation of warehousemen, insurance men, bankers and representative banking companies, whereby standard products in a licensed warehouse become as good as money in hand.

24. Regulations for the enforcement of the standard Container Act were promulgated and package manufacturers and produce shippers have been advised of requirements of this law through personal visits of Department representatives at factories, in shipping sections, and at public meetings. Without working hardships on the interested parties the law

(a) Eliminates from the markets many unstandardized containers.

(b) Makes possible more satisfactory handling and marketing of fruits and vegetables.

BUREAU OF CHEMISTRY.

1. Has enforced the Food and Drugs Act prohibiting the adulteration and misbranding of food and drugs when shipped in interstate commerce; the Sherley amendment to the Food and Drugs Act prohibiting manufacturers from making false and misleading claims as to the efficacy of patent medicines, and the Net Weight amendment requiring an accurate statement of the quantity of the contents of foods in packages.

   (a) Swindling has been prevented without unnecessary interference with the food industry.

   (b) Has reduced the interstate traffic in unwholesome food and drugs through improved systems of inspection and analysis, and by means of effective prosecutions and warnings.

   (c) Has greatly increased the deterrent effect of this act on unscrupulous dealers, and has done much to relieve honest producers from the unfair competition of adulterated foods and drugs through the publication of the Service and Regulatory Announcements and through widespread communication of decisions, rulings and results of prosectuions to the public.

2. To increase the supply and lessen the cost of pure food, active assistance and cooperation have been given to manufacturers and handlers of food by helping them to avoid waste and spoilage, save valuable by-products and ship certain perishable foods so as to arrive in good order.

3. Has greatly assisted the naval stores industry through the development of permanent and standard type samples for use in grading. These samples have been widely adopted for the naval stores industry and have resulted in limiting some of the inequities in the dealings in these products.

4. A large part of the work of the Bureau has been devoted to purely war-winning ends. Much has had to do with foods and the relative nutritive value of several substitutes for those foods which now have to be saved. Conservation of foodstuffs also has been demonstrated; it has been shown, for example, that wheat is neither necessary nor desirable as a feed to fleshen chickens.

5. Has made important analyses of food for other departments of the Government, particularly the War and Navy Departments, some 681 such analyses having been made in the last year.

6. Has obtained much valuable data regarding the effect of variations

in seed, climate and soil, on the chemical composition of the varieties of wheat and grain sorghums. Information has been obtained as to the effect on the crop and composition of crops by the application of the various constituents of fertilizers at different stages of the crops' growth.

7. Has obtained valuable information regarding the effect which variations in the compositions of leather and in tanning materials have on the wearing qualities of leather. Methods for determining the composition of leather and of testing its wearing qualities are being worked out. This work is proving of great value to the War Department in making specifications for shoes for soldiers.

8. Has developed methods by which certain tannery wastes which were not only lost but in many cases were a nuisance because of their pollution of streams, have been utilized profitably as fertilizers. Methods of tanning leather on a small scale are being perfected for the use of the farmer and the small tradesman.

9. Has effected economies in the use of paper-making materials by showing that in many cases light weight paper can be made to serve better than heavier paper.

10. Has developed simple and inexpensive methods applicable to farm use for both water-proofing and mildew-proofing fabrics for wagon covers, tents, tarpaulins and for other uses. Started as a project primarily for the farmer, it has developed information of great value to the War Department.

11. Has made considerable progress in regard to the development of methods for drying potatoes for stock feed and for preserving fruit juices. New methods for utilizing fruits and vegetables which are now wasted either because of unsuitableness for food or because of over production, are being studied.

12. Has developed and demonstrated devices which will prevent the food-and-property-destroying explosions of smut dust in thrashing machines. Also is studying the physical and chemical properties of grain and cereal dust which occur and which are thought to cause explosions in thrashing machines, mills and elevators.

13. In an investigation to develop new and cheaper methods for manufacturing dyes, a new chemical process has been devised for the manufacture of phthalic anhydride which is one of the most valuable compounds used in the manufacture of dyes. This process is now being tested on a large scale and promises to be the most economical one that has ever been used for this purpose.

(a) A new and valuable method for the production of chlor derivatives has been devised and this process has been tried upon a large scale. The results show that the process is extremely practical and produces some very valuable compounds which are used in the dye industry in a very economical manner.

(b) A process for the manufacture of indigo, some eight to ten million pounds of which dye ordinarily are consumed in this country annually has been investigated with a view to its introduction.

BUREAU OF BIOLOGICAL SURVEY.

1. Has conducted a war on predatory animals, which destroy annually $25,000,000 to $30,000,000 worth of meat animals on the public lands in the West.

   (a) Has originated and developed an organization for the control of predatory animals through a force of about 300 hunters and trappers.

   (b) By trapping and shooting it has destroyed in this period 60,216 wolves, coyotes, bobcats, mountain lions, and other stock-killing animals, and has killed by poisoning great numbers of coyotes over extended areas.

   (c) In addition to effecting a large saving of cattle, sheep, goats, horses, swine, and poultry, it has also controlled the spread of rabies in five States and greatly reduced the danger to human life from this disease.

2. In many States it has promoted extensive campaigns by poisoning for the destruction of ground squirrels and other rodents that cause losses to crops aggregating more than $150,000,000 annually.

   (a) In North Dakota organized campaigns against ground squirrels, in cooperation with the State Extension Service, resulted last year in the practical extermination of 77 per cent of the pests on 19,000 farms, representing 7,500,000 acres, thereby effecting an estimated saving of more than $1,500,000 worth of crops.

   (b) During the current year 33,000 farmers are cooperating in North Dakota covering an area of more than 13,000,000 acres, and in Montana more than 18,000 farmers are cooperating in a similar campaign.

3. It has demonstrated effective methods of poisoning jack rabbits, which destroy large quantities of wheat, barley, oats, alfalfa, and other growing crops and stacked hay, and has organized campaigns in farming communities agains these pests.

   (a) In one county in Oregon about 75,000 rabbits were poisoned the winter of 1915-16 at a cost of less than one-tenth of a cent each.

4. It has developed a very effective poison with which it has prosecuted vigorous campaigns against prairie-dogs upon national forests and other public lands.

   (a) On seven national forests in the Rocky Mountain States prairie-dogs have been much lessened in numbers, thereby, according to

an estimate of the Forest Service, improving the range for live stock fully 50 per cent.

(b) On more than 3,000,000 acres 90 per cent of the prairie-dogs were killed by the first poisoning at a cost of 5 to 10 cents an acre. Where repoisoning was carried on, it resulted in the practical extermination of the pest.

5. It has undertaken a nation-wide campaign for the more adequate control of house rats and mice, notorious destroyers of field crops, stored products, and poultry. It is now working to acquaint people with the seriousness of the losses and with simple and effective means of preventing them. Several States and many cities and communities are joining in this work.

6. It has established a fur farm to conduct experiments in raising fur-bearing animals, to be developed as an agricultural activity.

7. It has collected and published information on the distribution, abundance, and habits of birds and animals in various parts of the United States, this information being necessary in connection with the administration of Federal laws.

8. It has maintained five big-game preserves and 69 bird reservations.

9. It has, through administration of the Lacey Act, reduced materially interstate traffic in wild birds and game killed or shipped in violation of State laws.

10. It has administered the migratory-bird law, which protects by closed seasons our migratory wild-fowl, thus adding to the food supply by effecting an enormous increase in their numbers.

11. It has assisted in formulating the treaty between the United States and Great Britain for the protection of game and insectivorous birds migrating between the United States and Canada, a conservation measure of far-reaching importance.

12. It has completed biological surveys in Alabama, New Mexico, North Dakota, Wyoming, and Oregon, and made substantial progress in eight other States.

BUREAU OF SOILS.

1. Has made detailed soil surveys in the past five years in 321 different areas, the unit of survey in most cases being an entire county. These areas are located in 40 States and embrace about 185,149 square miles. In addition 18 reconnoissance surveys, covering a total area of about 118,072 square miles and including extensive areas in Alaska to determine their agricultural possibilities, were made. The results of these surveys, which show the location of the soils and their usefulness to agriculture, are made available to farmers through detailed reports and large colored soil maps. Nearly all this work is now done in cooperation with the various States.

2. Has made marked progress in the development of domestic sources of the three principal ingredients of fertilizer -- potash, nitrogen, and phosphate.

3. Has investigated the manufacture of nitrogen, particularly the fixation of the nitrogen from the air by electrical processes, and has proposed an apparatus and process for rendering garbage and other wastes.

4. Has found that the cement plants of the country might recover 70,000 tons of actual potash every year, with possibilities of getting 100,000 tons.

5. Has erected on the Pacific Coast a plant for the recovery of potash from kelp, a giant seaweed abundant in southern California sea coast waters. Before the war Germany had practically a monopoly on all the potash trade in this country.

6. Is cooperating effectively with the War Department in investigating the fixation of atmospheric nitrogen for use in munitions and for fertilizer. The War Department's nitrate plant is to be used for the production of fertilizers in time of peace as well as for munitions in war time. Experiments so far carried on have resulted in the production of ammonium nitrate, valuable not only as a fertilizer but very largely used in the present war as a primary explosive.

7. Has perfected and demonstrated on a commercial scale a process for producing double acid phosphate by smelting phosphate rock and collecting the phosphoric acid so produced, in an electric precipitator.

8. Work in connection with soils information and advice was greatly augmented by the home garden movements of 1917 and 1918. Likewise the need for increased food production led to a study of records and results to determine those soils most productive of staple crops.

9. Has made other studies aimed to secure a more effective use of agricultural lime and toward the solving of the soil erosion problems of the Southern States, both of which lines of work have progressed satisfactorily.

BUREAU OF CROP ESTIMATES.

1. Works through a small but efficient force of trained field agents and a corps of approximately 175,000 volunteer crop reporters throughout the country.

2. The monthly and annual crop estimates of this bureau have kept the country constantly informed regarding agricultural production. In addition to these current estimates, the bureau has estimated and reported.

   (a) Past acreages and production.

   (b) Effect of weather on crops.

   (c) Crop and live-stock losses from plant and animal diseases and insect pests.

   (d) Normal rates of consumption.

   (e) Exports and imports of various food crops.

   (f) Present and future requirements of various crops.

3. The Bureau's corps of voluntary crop reporters enables it to ascertain quickly conditions on farms with respect to

   (a) The supply of seed and labor;

   (b) Farm stocks of food and forage;

   (c) Progress of farm work;

   (d) Farm prices;

   (e) Prospective crop production.

4. In respect to some of the most important food crops, its estimates and records have already proved invaluable and this has been particularly true of the supply of sugar and cereals.

5. Its estimates have formed the basis of much of the constructive work of the Department of Agriculture and the State agricultural colleges in stimulating crop production in time of war.

   (a) The information thus furnished in the Monthly Crop Reports and the timely advice of the Department have enabled farmers

to modify the relative acreages of the various staple crops, to the end that prospective shortage might be overcome, either by augmented plantings or by the increase of supplementary crops.

(b) That this was done on a huge scale is shown by the fact that the farmers of the United States planted 23 million acres more in staple food crops in 1917 than in 1916, and 32 million acres more than the average for the five years preceding the war. This great increase is almost equal to the average total acreage of cereals in Germany before the war.

6. The bureau is acquiring and systematizing the most complete collection of agricultural statistics on world crops and live stock anywhere in existence — a record particularly valuable in war time and one that is bound to be of immense value in the days of agricultural reconstruction that will follow the close of the war.

7. The accuracy of the bureau's estimates have been proved repeatedly. In the case of cotton, there is an absolute check on the accuracy of the crop forcast, because the Bureau of the Census of the Department of Commerce is required by law to report the number of bales of cotton actually ginned each year. In a period of seventeen years, in which nearly 100 billion pounds of cotton were ginned, the Bureau of Crop Estimates underestimated the total by less than 1.5 per cent. For the three years 1914-16, on figures issued more than three months prior to the final ginning returns, the error in the estimates was only six-tenths of one per cent. The estimate of the rice crop for 1915, compared with the returns from all the rice mills for that year, showed an underestimate of only two-tenths of one per cent.

8. Special activities during the last year have included

(a) Establishment of a weekly truck crop news service.

(b) A strengthening of its field organization and the establishment of cooperative relations with State departments of agriculture with a view to improve the crop reporting service in a number of States.

(c) A number of special investigations bearing on war work which served to allay unfounded apprehension with respect to the food supply and as a guide in forming plans for the future.

(d) An increase of 50 per cent in the number of schedules handled.

INSECTICIDE AND FUNGICIDE BOARD.

1. Prevents, under the Insecticide Act of 1910, the interstate shipment, importation and manufacture and sale in the District of Columbia and the Territories, of misbranded and adulterated insecticides and fungicides.

2. As a result of many examinations of samples, correspondence with manufacturers, and prosecutions, farmers, fruit growers, market gardeners and stock and poultry raisers are able to rely as never before on the claims for efficacy and strength made by manufacturers of insecticides and fungicides.

3. Greater reliance may also be placed on products to rid the household of insects, and disinfectants, germicides, etc., which are used to combat or kill bacteria.

4. The operation of the law, up to 1916, had the effect of reducing the violations in respect to lead arsenate from 60 per cent to 8 per cent, Paris green from 28 per cent to 19 per cent, lime suplhur solution from 94 per cent to 14 per cent and Bordeaux mixtures from 98 per cent to 36 per cent.

5. Analyses and tests the efficacy of samples of commercial insecticides and fungicides collected by inspectors operating throughout the country, and to obtain basic facts to aid in the enforcement of the law makes special field and laboratory investigations and tests of substances entering into such insecticides and fungicides to determine whether or not they are active or inert for the control of certain insects and fungi for which they are recommended.

FEDERAL HORTICULTURAL BOARD.

1. Regulates the entry of foreign nursery stock and other plants and plant products into the United States, and promulgates and enforces domestic and foreign quarantines on account of plant diseases and insect pests. Has now in force

   (a) Eleven foreign quarantines relating, among others, to corn diseases, fruit fly, white pine blister rust, citrus canker, sugar cane diseases, sweet potato weevils and the pink bollworm of cotton;

   (b) Nine domestic quarantines relating, among others, to the white pine blister rust, the Mediterranean fruit fly, and the gipsy moth and brown-tail moth.

   (c) Restrictive orders controlling the entry of nursery stock, cotton potatoes, corn and various fruits to prevent the entry with such products of important insect pests or plant diseases.

2. In connection with the outbreak of the pink bollworm discovered in Texas in 1917,

   (a) Has conducted an extensive campaign of eradication involving the destruction and clean-up of cotton in and surrounding the districts of Texas invaded by the pink bollworm;

   (b) Cooperated with the State of Texas in the prohibition of the growth of cotton in the known infested districts in Texas, and in the maintenance of a cotton-free zone along the Mexican border;

   (c) Has established a traffic control along the Mexican border to prevent further entry of the insect from Mexico which involves inspection and fumigation of all cars and freight entering the United States from Mexico.

   (d) Is cooperating with the Mexican Government and planters in an effort to control the pink bollworm in Mexico,

   (e) Has established a research station in the Laguna, the principal cotton producing-section of Mexico, to determine the life history and methods of control.

OFFICE OF FARM MANAGEMENT.

1. Published a geography of the world's agriculture and has now in press several sections of an extended atlas of American agriculture which will be of great value to all students of agriculture in this country.

2. Worked out satisfactory methods of determining the value of stable manure on the farm; of determining the rate of depreciation of dairy cows and work horses; of analyzing the business of the individual farm and calculating the farmer's net income.

3. Perhaps the most important achievement of the office is the demonstration of the value of the study of farm practice in the solution of many agricultural problems. It is now applying this method, commonly known as the survey method, to a great variety of problems with gratifying results.

4. Demonstrated a method of ascertaining the most profitable types of farming for given soil, climatic, and economic conditions, and the most profitable farm organization in each type. This method has been applied to a number of important agricultural regions with resulting benefit to local farmers.

5. Worked out a satisfactory system of farm accounting, which is now in use on a large number of farms. This system is merely a refinement of a system which was found in operation, often in crude form, on the farms of a large number of men who had invented their own system of keeping records without previous knowledge of bookeeping. The uniformity of methods found under these conditions pointed the way to the fundamental principles involved and resulted in the development of a method which farmers find satisfactory.

6. Has shown how to determine the minimum economic unit or the smallest efficient size of farm in different regions, and with different types of farming.

7. Determined the conditions under which the tractor is a desirable part of the farm equipment and has shown what size tractor should be used on farms of various sizes.

8. Has done much to popularize the larger types of labor-saving machinery, and thus to increase the horse power per man on the farm.

9. In cooperation with the Department of labor, the extension forces of the Department of Agriculture, and the various State institutions, has developed a plan for ascertaining the labor needs of the farmer and of supplying these needs. The Office of Farm

Management has not only assisted farmers to farm a larger acreage with less help than they had before the war, but, in cooperation with the agencies named, has been able to supply large numbers of laborers.

10. Through the farm help specialists in every State campaigns were launched for forcing idlers to work, either by the influence of public opinion or through the passage of effective State laws, and also to get the people with farming experience in cities and towns to assist farmers during critical periods. Along the Mexican border the farm help specialists have assisted in the problem of obtaining additional Mexican laborers for work on sugar beet and cotton plantations.

OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING.

1. Administered the provisions of the Federal-aid road act, approved July 11, 1916, which is believed to have done more for the cause of good highways than any other enterprise ever conceived in this country.

   (a) March 1, 1918, a total of 383 project statements had been submitted, of which 265 had been approved, 6 disapproved, 3 canceled, and 4 withdrawn. The total mileage covered by these projects is 4,453.66 miles and the total estimated cost is $28,164,672.77, of which amount the States asked the Federal Government to assume payment of $11,129,815.69.

2. Built and maintained 30 miles of experimental roads in the vicinity of Washington.

3. Furnished engineers to supervise the construction of approximately 12,500,000 square yards of object-lesson and other roads.

4. Constructed 17 post roads, including 435 miles, under the Post Office Appropriation Act of 1912, of which the Federal Government paid one-third the cost, or a total of $500,000.

5. Furnished engineers to make inspection and give advice on 260 projects in 40 States.

6. Planned model highway systems in 93 counties in 25 States for use by county officials as a basis for determining the best methods of road construction and proper tax levies or bond issues for constructing the proposed system.

7. Prepared 102 designs for bridges in 18 States, exclusive of the preparation of standard designs.

8. Tested 6,021 samples of road material, of which 1916 were chemical and 4,105 were physical, samples having been tested from every State.

9. Conducted various other forms of research and educational work in connection with road and bridge building.

10. Since January 1, 1917, the Office of Public Roads has conducted the engineering and construction work in connection with most of the highways in the National Forests.

(In July, 1914, all activities of the Department involving rural engineering problems were placed under the Office of Public Roads. At the same time irrigation and drainage investigations of the Department were placed under this office. The principal activities of the Division of Rural Engineering since July, 1914, were as follows:)

11. Prepared 97 standard designs for farm structures of various kinds, and designed 58 pieces of work for other bureaus, including apparatus and buildings, costing from $100 to $75,000.

12. Prepared plans and gave advice in connection with 52 water supply and sewage disposal systems, 4 refrigerating and 8 heating plants.

13. Designed a variety of mechanisms for farm appliances, several of which have been granted public patents.

14. Recommendations were made and adopted as to the basis of pronounced modifications in standardization of farm wagons for the Wagon Manufacturers' Association.

15. The Drainage Division has given aid to a large number of drainage districts, has assisted in the drafting of a number of state drainage laws, and has promoted the use of tile drains in many localities.

16. Farm Irrigation Investigations have introduced better methods on 15,000,000 acres of irrigated land, designed measuring devices, aided in the passage of better irrigation laws, and made plans for drainage of 375,000 acres of irrigated lands.

(Since the beginning of the war the office has established cooperative relations with a number of Government agencies, in order to more effectively deal with the work of highway construction and maintenance as affected by war conditions.)

17. Arranged with the Fuel Administration for passing upon applications for approval of highway projects involving the use of oils, tars, and asphalts.

18. Cooperates with the Railroad Administration in passing upon the necessity for highway construction and maintenance involving the use of open-top cars over and above the supply locally available.

19. Cooperates with the War Industries Board in applying the Government price of cement to Federal-aid roads and in handling questions of priority as affecting structural and reinforcing metal and other materials entering into highway work.

20. Cooperates with the Capital Issues Committee in reporting upon highway bond issues involving an outlay of $100,000 or more.

21. Cooperates with the War Department through the assignment of an engineer to each of the 16 army cantonments for highway work, supervising the construction of a number of roads leading to cantonments and posts, conducting map work, and devising equipment to determine the power of high explosives, etc.

22. Cooperates with the Shipping Board in tests and design in connection with the construction of concrete ships and in their department dealing with the housing of ship workers.

23. There has now been organized the United States Highways Council, composed of one member from the War Department, the Department of Agriculture, the Railroad Administration, the Fuel Administration, the War Industries Board. This council will coordinate the work of the respective Government agencies in relation to highways, under the chairmanship of the Director of the Office of Public Roads.

FOREST SERVICE.

1. The Department of Agriculture has stood unflinchingly for the continued Federal control of our great National Forests, and for their efficient and economical administration and protection. As public properties they are now serving both the general and local welfare more satisfactorily than ever before.

2. Notable achievements have marked the five-year period since 1913.

   (a) The National Forest enterprise has gained greatly in permanence;

   (b) Present usefulness of the Forests has been materially developed;

   (c) Their productive capacity has been not merely safeguarded but increased;

   (d) Their cash returns to the Government have become 60 per cent greater;

   (e) Regulated development of the great water-power resource has been guided along lines fair to the investor and at the same time protective of the interests of the consuming public;

   (f) The cost of administration, in proportion to the volume of business, has been reduced;

   (g) The control of forest fires has become much more effective.

3. Further, as a result of the systematic and scientific working out of foresighted methods of handling the forest resources, and as a result of accumulated knowledge of the industries which derive material from our forests and of the basic problems involved in production, the Department of Agriculture was ready at the outbreak of the war to contribute materially to increased production of meat, wool, and hides through more intensive use of the National Forest ranges and to render important services to the army and navy in matters connected with munitions production, shipbuilding, airplane construction, and many other matters.

4. The National Forest enterprise has been given greater permanence through constructive administration, through wider public approval in consequence of efficient handling of the public business, and through the securing of constructive legislation.

(a) Important court decisions have established the basic soundness of the conceptions which have underlain the plans for development.

(b) Lands suitable for agriculture included within the National Forests have been sought out, segregated, and opened to settlement.

(c) The portions of the forests not suitable for permanent ownership and administration by the Government for the growing of timber, the protection of streamflow, and other forest uses have likewise been segregated and restored to the public domain.

(d) Roads, trails, and other improvements facilitating use have been constructed.

(e) Community development has been promoted.

(f) The building up of eastern forests through the purchase of lands in the Southern Applachian and White Mountain regions has been notably advanced.

5. Other facts pointing to the increased usefulness of the forests are

(a) In 1912 the numberof timber sales made from the National Forests was 5,772; in 1917, 16,294.

(b) The cut of timber in 1912 was 554,725,000 board feet; in 1917, 840,612,000 board feet.

(c) In 1912 there were grazed, on a National Forest area of 165,000,000 acres, 9,054,427 head of domestic livestock covered by paid permits issued to 21,188 users; in 1917 there were grazed, on a National Forest area of 155,000,000 acres, 11,253,524 head of stock covered by paid permits issued to 31,136 users.

(d) The number of livestock grazed free by local settlers has been increased materially.

(e) These figures show increased participation in commercial use of the Forests by small users, as well as a larger volume of use.

(f) A great advance was also made in the number of users of the forests for recreation purposes and in the constructive development of the recreation resource of the forests — destined to be of incalculable public value.

(g) The total receipts from the National Forests in 1912 were a little over $2,100,000; in 1917, nearly $3,500,000.

(h) The National Forests are now nearly paying their operating expenses.

6. In the field of industrial research the Forest Service is doing work of fundamental character and inestimable importance to the country. The forest products laboratory leads the world in orgainzation and equipment for advancing knowledge along lines that contribute to national efficiency in the industries deriving their raw material from our forests.

(a) It has shown how to secure greater yields, lessen waste, and use material to better advantage, in ways too numerous to be briefly enumerated.

(b) In actual money outlay its studies now mean savings to the Government alone of sums that run into the millions.

7. The war found the Forest Service personnel ready for many forms of service, Nearly one-third of the personnel of the Forest Service has changed within the past year, and a great many of its members are now overseas with the Tenth and Twentieth Engineers, forestry regiments, which the Forest Service helped the War Department to organize, and in other army units.

WEATHER BUREAU

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1. Has conducted its work wholly in the interest of agriculture, commerce and navigation, and has planned its research work with a view to improving its service in these three important interests.

2. The work of the bureau in the immediate service of the public may be classified broadly as

   (a) Weather forecasts and warnings.

   (b) River and flood service.

   (c) Climatological service.

   (d) Agricultural meteorology.

   (e) Aerology, in aid of aviation.

2. Distribution of daily forecasts, its principal and most important function, has been continued and extended so that at present within two hours after the morning observations have been taken forecasts are telegraphed from the forecast centers to about 1700 principal distributing points, whence they are further disseminated by telephone and mail, reaching nearly 100,000 addresses daily by mail and being made available to more than 5,000,000 telephone subscribers within approximately an hour after the time of issue -- this in addition to the distribution effected through the press associations and the daily newspapers.

3. Has greatly increased the extent and efficiency of its special weather warning service, designed to give farmers, fruit and truck growers, foresters, and stock raisers sufficient notice of the approach of dangerous weather conditions to enable them to protect their products.

4. Has improved its equipment for the dissemination of storm warnings at night.

5. Has aided in the protection of life and property at sea and along the coast by special arrangement for the early detection of storms, especially in the Caribbean Sea, and by a widespread distribution of warnings of tropical hurricanes to the regions threatened.

6. Its service has been made praticularly valuable to mariners through the cooperation of the Naval Radio Service which now distributes daily to ships at sea and on the Great Lakes weather information, forecasts and storm warnings. This service has been extended to the Caribbean Sea and to the Panama Canal Zone.

7. Is cooperating with the War Department, both in this country and in Europe, in furnishing information as to weather and upper air conditions for use by the aviation and artillery services. Suitable sites for five additional aerological stations for the observation, measurement and investigation of atmospheric phenomena, in the aid of aeronautics, have been seclected by the bureau at as many points in this country under the Army Appropriation Act for the year ending June 30, 1918, which authorized $100,000 for this purpose.

8. Through its river and flood service which is organized with its principal headquarters at Washington, D. C., and subsidiary district centers, about sixty in mumber, throughout the country, it has collected by telegraph and telephone data of precipitation and gage readings from about 450 stations on which are based daily forecasts of rise and fall, and stages during the low water season and warnings of dangerous floods in the respective rivers.

9. Through its climatological service it has secured daily observations of temperature and rainfall from about 4,500 cooperative stations representing all sections of the country and published the data separately by States in the form of monthly reports that are given wide distribution.

10. It has collected and disseminated information relative to the effect of weather and climate upon the crops, and during the crop growing season, namely; April to September, inclusive, each section center receives by mail, reports from numberous correspondents concerning the effects of the weather upon crops and farm operations, and issues weekly bulletins containing the data thus obtained. During the same season the central office at Washington issues weekly a National Weather and Crop Bulletin containing a series of charts graphically illustrating the current and normal conditions of temperature and rainfall throughout the country, a general summary of the effects of the conditions on the staple crops and a brief report of the conditions on the crops in the respective States. Throughout the cotton, corn, wheat, and sugar and rice producing sections, designated centers have received and published in bulletin form telegraphic reports of rainfall and daily extremes of temperature.

11. The Bureau has aided the farm labor problem during the current season by charts in its weekly crop bulletins which show where the harvesting of the various crops have begun, and where crops will be ready for harvest one or two week in advance. This information is obtained by telegraph and forwarded promptly to the Office of Farm Management where it is used in anticipating labor needs in different parts of the country.

PUBLICATION AND INFORMATIONAL WORK OF THE DEPARTMENT.

1. Realizing that information of great value to the people was being gathered by the Department's specialists more rapidly than it was being circulated, the present administration from the start sought means of making this information available more promptly and in popular, understandable form. This was undertaken through

   (a) A new classification of publications.

   (b) The establishment of the Office of Information.

2. By the new classification of publications a sharp line has been drawn between the strictly scientific and the popular bulletins, with a view to present the two kinds of information more effectively to those for whom it is intended and to prevent the waste arising from a miscellaneous distribution of the scientific bulletin. The confusion which had existed as the result of multiplicity of series of publications was eliminated so that instead of having no less than forty different series, there are at present only four general classes, namely

   (a) Farmers' Bulletins, popularly written and designed to give specific directions for doing things.

   (b) Department Bulletins, carrying semi-technical results of investigations.

   (c) The serial publications, including the Journal of Agricultural Research, the Experiment Station Record, and the Weekly News Letter.

   (d) Annual reports and other congressional publications, including the Yearbook and soil surveys.

3. During the four years ending July 1, 1917, 160,000,000 copies of publications carrying messages of better farming and better home life were distributed by the Department. To stimulate production and conservation this work has been greatly enlarged in the last year with the result that approximately 100,000,000 copies of the publications were distributed in the year ending June 30, 1918.

4. Through the Office of Information the Department makes prompt distribution to the press of discoveries and advice. The Department has studied the needs of the press by conferences with editors and through detailed questionnaires sent to them. The informational news service, several of which have been inaugurated since the war to stimulate food production and food saving are as follows:

   (a) The Weekly News Letter which is sent to some 20,000 publications and to Federal and State agricultural workers and cooperators.

(b) The Plate Service in which the advice of the Department's specialists is furnished through a plate manufacturing concern to a large proportion of the 12,000 or more country weeklies and to the small dailies.

(c) The Special Information Service an illustrated weekly news syndicate under four departments of two columns each discussing war problems of food production and conservation. Now furnished on request to more than 3,000 afternoon dailies and weeklies in addition to many smaller papers which obtain it from plate-making concerns in plate form.

(d) The mimeographed News Service furnished daily or as the necessity for prompt distribution demands to newspapers, agricultural journals and specialized publications -- generally or locally.

(e) Circulars, posters and other advertising matter to aid in special educational campaigns.

(f) Seasonal illustrated news series such as the Home Garden Series and the Canning-Drying Series, which are calculated to aid in the Department's special campaigns of one sort or another.

(g) A Weekly News Review under the head "What the Department of Agriculture is doing" through which newspapers and agricultural journals are advised week by week of results and progress obtained by the Department's forces in war emergency activities chiefly, but also of useful information obtained in the regular work of the Department.

PLANS AND ACTIVITIES

OF THE

UNITED STATES DEPARTMENT OF AGRICULTURE

1913-1919

Issued July 1, 1919.

MEMORANDUM July 1, 1919.

SUMMARY OF IMPORTANT PLANS AND ACTIVITIES
OF THE DEPARTMENT OF AGRICULTURE
1913 - 1919.

American food production played a glorious and important part in the great war. While hunger stalked within the enemy countries and craving stomachs overruled minds that logic could not convince, a veritable flood of food was poured from the rich producing areas of the United States into the stores of the American army and the forces of the associated powers. Thus the American farmer backed the American fighter.

And the American farmer was backed by the United States Department of Agriculture, which not long ago was described by President Wilson as "the greatest practical and scientific agricultural organization in the world". From the very beginning of America's participation in the war it strove to bring about the production of a generous supply of agricultural products in this country, and now is redirecting its efforts toward the peace-time aim of balanced and prosperous farming.

Agriculturally, America was prepared for war. So generously had the American people supported agricultural legislation and development, and so thorough was the organization of the Federal and State agricultural forces, that three days after war was declared representatives of these agencies, headed by the Secretary of Agriculture, sat in conference at St. Louis and drew up a program of food production and conservation, the wisdom of which has not been successfully questioned and the substantial

part of which, four months later, had been enacted into law. It is doubtful whether the efficiency thus demonstrated has been equalled by any other country.

LEGISLATION

The following legislative enactments of the four years preceding 1917, which since have been supplemented by other notable agricultural war measures, also described briefly below, made possible, to a considerable extent, the immediate mobilization of American agriculture.

(1) The Cooperative Agricultural Extension Act of May 8, 1914, known as the Smith-Lever act, appropriated $480,000 outright for the first year and for each year thereafter, $600,000 additional for the second year, and an increase of $500,000 annually thereafter until 1922-23, with the requirement that the States duplicate all amounts in excess of $480,000. For 1922-23, and annually thereafter, the Federal government will appropriate $4,500,000 which, with the States matching all amounts above $10,000 a year each, will make available a total of $8,680,000 a year. The object of this act is to take directly and effectively to the farmer on his farm the information resulting from the activities of the Department and of the State Agricultural Colleges and to induce him to apply it. The marked success and the far-reaching effect of this legislation, described by Secretary Houston as one of the most striking educational measures ever adopted by any Government, is set forth elsewhere under the report of the States Relations Service, which administers the act.

(2) The Cotton Futures Act of August 18, 1914, reenacted with amendments in the agricultural appropriation act for the fiscal year

1917, and further amended by special legislation under the wheat price guaranty act, has resulted in the establishment of definite standards for cotton, has made possible the supervision of the operations of the futures exchanges, and has placed cotton trading on a sounder basis. The report of work done by the Bureau of Markets, which administers this act, found on page 33, deals more specifically with results obtained under it.

(3) The United States Grain Standards Act, which was included in the agricultural appropriation act for the fiscal year 1917, is bringing about uniformity in grading, is enabling the farmer to obtain a fairer price for his product and to improve its quality, and is preventing or diminishing materially the shipment of adulterated grain. A more detailed report of the working of this act is contained in the report (page 33) from the Bureau of Markets, which administers it.

(4) The United States Warehouse Act, also included in the agricultural appropriation act for 1917, authorizes the Department of agriculture to license bonded warehouses which handle certain agricultural products. It makes possible the issuance of reliable and easily negotiable warehouse receipts, promotes the better storing of farm products, and encourages the standardizing of storages and of marketing processes. For more detailed report of work under the act, see report of Bureau of Markets, page 34.

(5) The Federal Farm Loan Act was approved July 17, 1916. It creates a banking system which reaches intimately into the rural districts, operates on terms suited to the farmer's needs under sympathetic management, introduces business methods into farm finance,

brings order out of chaos, reduces the cost of handling farm loans, places upon the market mortgages which are a safe investment for private funds, attracts into agricultural operations a fair share of the capital of the Nation, and reduces interest rates.

(6) A provision in the Federal Reserve Act, approved December 23, 1913, authorized national banks to lend money on farm mortgages and recognized the peculiar needs of the farmer by giving his paper a maturity period of six months.

(7) The Federal Aid Road Act, approved July 11, 1916, provides for cooperation between the Federal Government and the States in the construction of rural post roads and of roads and trails within or partly within the National Forests. It has conduced to the establishment of more effective highway machinery in each State, strongly influenced the development of good road building along right lines, stimulated larger production and better marketing, promoted a fuller and more attractive rural life, added greatly to the convenience and economic welfare of all the people, and strengthened the national foundations. It appropriates from the Federal Treasury the following amounts, to be expended in cooperation with the States in the construction and improvement of rural post roads: For the fiscal year 1917, $5,000,000; 1918, $10,000,000; 1919, $15,000,000; 1920, $20,000,000; 1921, $25,000,000; total $75,000,000. It also appropriates $1,000,000 annually, during a period of ten years, for the construction of roads and trails within and adjacent to the National Forests. As the States are required to made available at least equal amounts, or their equivalent in labor and materials, the act provides a total of not less than $150,000,000 for cooperative construction work extending

over a period of five years.

An amendment in the Post Office Appropriation Act for the fiscal year 1920 provided additional funds for rural post road construction - $50-000,000 in 1919; $75,000,000 in 1920; and $75,000,000 in 1921 -- and made more liberal the terms under which the States can receive the benefits of Federal aid in highway building; it also made available $9,000,000 more -- $3,000,000 for each of these years -- for constructing roads within or partly within the National Forests.

(8) The Food Control Act of August 10, 1917, vested in the President regulatory powers, in considerable part of a commercial nature, to be exercised through an emergency agency, rather than through an existing department, to deal with special and urgent national and international food problems growing out of the war. The provisions of the Food Control Act, so far as they relate to food and feedstuffs, were executed by the Food Administrator.

(9) The Food Production Act of August 10, 1917, an act "to provide further for the national security and defense by stimulating agriculture and facilitating the distribution of agricultural products," was administered by the Department of Agriculture and carried an appropriation of $11,346,400 for the following purposes during the fiscal year 1918:

1. Prevention, control, and eradication of diseases and pests of live stock; enlargement of live-stock production; and conservation and utilization of meat, poultry, dairy, and other animal products, $885,000.

2. Procuring, storing, and furnishing seeds for cash at cost to farmers in restricted areas where emergency conditions prevail, $2,500,000.

3. Prevention, control and eradication of insects and plant diseases injurious to agriculture, and conservation and utilization of plant products, $441,000.

4. Further development of the Extension Service which is conducted in cooperation with the agricultural colleges in the various States, $4,348,400.

5. Surveys of the food supply of the United States; gathering and disseminating information concerning farm products; extending and enlarging the market news services; preventing waste of food in storage, in transit, or held for sale; giving advice concerning the market movement or distribution of perishable products; and investigating and certifying to shippers the condition as to soundness of fruits, vegetables, and other food products received at important central markets, $2,522,000.

6. Development of the information work of the Department, enlarging the facilities for dealing with the farm-labor problem, and extending the work of the Bureaus of Crop Estimates, Chemistry, and Biological Survey, $650,000.

Provision for similar work during the fiscal year 1919 was made in the Food Production Act of November 21, 1918, carrying an appropriation of $17,531,863.

(10) With an appropriation of $10,000,000 contained in the Food Control Act, the Department of Agriculture during the fiscal year 1918 distributed to farmers for cash at cost approximately 75,000 tons of nitrate of soda; and a similar distribution was also made during the fiscal year 1919.

(11) Congress made available $200,000,000 to facilitate the operations of the Farm Loan Board because of the unusual demands on funds which otherwise might have been invested more freely in such bonds.

(12) Congress appropriated $4,000,000, in addition to the $2,500,000 in the Food Production Act of August 10, 1917, for the purchase and sale of seed to farmers for cash at cost during the fiscal year 1918; and made similar provision in the Food Production Act of November 21, 1918, for the fiscal year 1919.

(13) Under the powers given in the Food Control Act, there were placed under license and control by the Department of Agriculture -

(a) The ammonia industry
(b) The fertilizer industry
(c) The farm equipment industry
(d) The stockyards industry

(14) Under the Selective Service law -

(a) Skilled farm labor was given deferred classification, being placed in Class II.

(b) Assistant and associate managers of necessary agricultural enterprises were given deferred classification, being placed in Class III.

(c) Heads of necessary agricultural enterprises were given deferred classification, being placed in Class IV.

(d) In order to prevent the possibility of a failure of leaders in the agricultural field, provision was made for a reserve from the first-third of agricultural seniors in the agricultural colleges.

(15) The Secretary of War requested Congress to give him authority to furlough farmers in the National Army in order that they might return to their farms for certain periods if military conditions permitted it. The Congress granted the authority.

(16) Reorganization of the work of the Department has been effected along lines recommended to the Congress by the Secretary of Agriculture in November, 1914. Three groups of activities -- regulatory, research, and educational or extension -- have been definitely segregated in each bureau and important lines of work have been relocated. For example, the farm-demonstration work, which was a part of the Bureau of Plant Industry although it deals with all phases of production, was transferred to the Office of Experiment Stations, the name of which was changed to the States Relation Service. The office of Farm Management, which was also a part of the Bureau of Plant Industry although it deals primarily with the business and economic phases of farming,

was attached to the Office of the Secretary. Plans were formulated during the past fiscal year for the reorganization and further development of the work of the Office of Farm Management, including especially the studies of the cost of producing agricultural products. Although Congress failed to provide the additional funds requested for the purpose, the new plans are being carried out, under the direction of recognized leaders in the field of farm management and farm economics, to the fullest possible extent with existing authority and appropriations.

STATES RELATIONS SERVICE

1. The States Relations Service administers the cooperative agricultural extension act of May 8, 1914, which provides for a nation-wide system of instruction for the farming population in agriculture and home economics outside of the schools and colleges. It establishes a close co-partnership between the Federal and State agencies in the organization and administration of the extension service and, under it, the Department is under obligation not only to contribute to the formulation of plans of work which are to be mutually agreed upon but also to assist the colleges in executing them.

(a) This act, also known as the Smith-Lever Act, has made more effective the other laws establishing and making provision for the maintenance of the Department of Agriculture and the State experiment stations.

(b) Through its operation the Department of Agriculture and the agricultural colleges have established the broadest and most far-reaching system of popular education, based on practical knowledge and scientific research, yet devised.

(c) It involves the location in the several counties of agricultural agents and home demonstration agents who, through close contact with the people and intimate relations with the agricultural colleges, experiment stations, and this Department would be able to acquaint themselves thoroughly with the needs of the rural communities and carry to the farmers and their families on their own farms the latest and best practical and scientific information regarding the agricultural problems confronting them. It involves also demonstration work among boys and girls, and the assignment of specialists in the various branches of agriculture and home economics, whose headquarters would ordinarily be at the agricultural colleges or the Department, to supplement the activities of the extension agents.

(d) When the United States entered the war, this great educational system was well established and had

met with great favor in all sections of the Union. It was immediately recognized that, with its combination of Federal and State demonstration officers and specialists, county agents, home demonstration agents, boys' and girls' club agents, farm bureaus, and other local organizations, it furnished a ready and effective means for the nation-wide dissemination of the needed facts, as well as for practical demonstrations of the best methods of increasing agricultural production and securing the most economical utilization of the products of the farm. With remarkable promptness and unanimity, these agencies addressed themselves to the important problems of increasing and conserving the food supply and cordially furthered the Department's efforts in this direction. Fortunately, as the result of the investigations and experiments of the Department and of the State experiment stations, extending over many years, there was already available a large accumulation of scientific information ready to be put into practical use.

(e) Congress, in the Food Production Act of August 10,1917, provided an appropriation of $4,348,000, in addition to the amounts included in the Smith-Lever Act, for the immediate development and expansion of the cooperative extension system during the fiscal year 1918. In the Food Production Act of November 21, 1918, the sum of $6,100,000 was provided for a similar purpose during the fiscal year 1919.

(f) The extension force was increased, especially after the passage of the Food Production Act, until it numbered approximately 5300 workers, including about 1800 women. The number of community organizations of farmers, including farm bureaus, county councils, and the like, formed to aid the county agents, increased to 1200 with a membership of 500,000; and 1,200,000 boys and girls were enlisted in the club work.

(g) The total force engaged in this work increased from 2600 in 1914-15 to approximately 5300 on July 1,1919.

1. Number of counties having services of a county agent July 1, 1914, 1,140; July 1, 1919, 2,300.

2. Number of counties having services of home demonstration agent July 1, 1914, 280; July 1, 1919, 1,400.

(h) The total funds available for extension work from State and Federal sources have increased from $3,600,000 in 1914-15 to $15,000,000, the estimated amount that will be available from all sources during the fiscal year 1920.

2. The extension system attains its ends in four principal ways:

(a) Through practical demonstrations on the farms and in the homes.

(b) Through visual and oral instruction in movable schools and meetings.

(c) Through boys' and girls' clubs.

(d) Through the organization of farm men and women in county farm bureaus, county farm councils, community clubs, etc., to do for themselves many things which improve agriculture, home life, and community activities.

3. Conceived wholly for peace conditions, this organization proved to be one of the greatest agencies in speeding up war work in agriculture and home economics. Under the special provisions of the food production act:

(a) Extension organization and work in the rural communities were greatly increased.

(b) Home demonstration agents were located in the cities and gave instruction to large numbers of people in the best methods of conserving and utilizing the food supply. They also served as useful mediums for bringing city and country people into more sympathetic and helpful relations.

(c) The organized and combined cooperative efforts of specialists, county agents, extension workers from the State colleges and the Department, farm bureaus, farm councils, and other farmers' organizations, were responsible, in no small degree, for the increase in food production.

1. The Federal war program, so far as agriculture is concerned, was based, in considerable measure, on reports that came through this great organization to Washington.

2. Plans were made, then put into effect, quickening the smallest rural communities into productive action.

3. Thus was brought about increased acreage of staple crops, multiplication of home gardens in country and town, and the canning, drying and preserving of perishable surplus crops.

(d) Assistance was rendered in securing farm labor, and within individual States accurate surveys were made of agricultural supplies, thus facilitating the movement of labor, seeds and stock and the bringing together of the agricultural buyer and seller.

4. Through institutes and other meetings, three out of every four farmers in the United States are reached annually by Federal and State extension forces.

5. The records for the Southern States show the following results during the four years 1915-1918:

(a) Demonstrations in cotton increased from 20,245 to 39,123.

(b) Demonstrations in corn increased from 56,567 to 70,622.

(c) Demonstrations in alfalfa increased from 3,209 to 5,832.

(d) Total number of demonstrations in non-leguminous hay, forage, and cover crops increased from 10,042 to 17,916.

(e) Demonstrations in feeding hogs increased from 885 to 7,884.

(f) The number of herds of swine started, due to the activities of the agents, increased from 4,451 to 17,155.

(g) The number of various kinds of live stock treated at the suggestion of the agents increased from 1,736,823 to 4,778,141.

(h) The number of community or farmers' clubs organized increased from 1,712 to 7,093 and the membership from 44,548 to 237,429.

6. The results of these demonstrations become very apparent when comparison is made between the production in 1913 and that in 1918. These data indicate how thoroughly the southern farmers have taken the advice of the agents of the Department to maintain the acreage in cotton if possible and to increase the production of food and feed crops. In 1917,

for the first time, was the South able practically to feed itself. During these years the records show, for example, that

(a) The number of bushels of corn decreased from 829,-359,000 to 760,016,000, but this decrease was due to an excessive drought, the acreage showing an increase from 42,408,000 to 44,607,000.

(b) The number of bushels of wheat increased from 92,645,000 to 111,200,000, or approximately 20 per cent.

(c) The number of bushels of oats increased from 108,-617,000 to 142,100,000, or approximately 30 per cent.

(d) The number of tons of hay increased from 7,256,000 to 11,688,000, or over 60 per cent.

(e) The number of bushels of white potatoes increased from 37,843,000 to 60,039,000.

(f) The number of bushels of sweet potatoes increased from 52,604,000 to 79,066,000.

(g) Cooperative organizations under the leadership of the county agents purchased 64,382 tons of fertilizers, 751 carloads of cattle, 1,530 carloads of hogs, and 1,500,000 bushels of grain. The total value of these supplies was $17,000,000.

7. In the Northern and Western States, where the work is relatively new, the extension agents had a marked influence upon the agriculture in the counties where they are located. The records show, for example, that

(a) In crop-production campaigns, the agents assisted 348,212 farmers in securing or locating seed grain, amounting to 6,300,263 bushels. The number of additional acres seeded as a result of crop-production campaigns amounted to 5,392,240. Total increase production of all grains to meet the food shortage brought on by the war amounted to 70,145,369 bushels. In the fall of 1918, the agents were instrumental in having 4,718,691 bushels of seed corn selected for the 1919 planting in order to prevent a recurrence of the seed corn shortage experienced in 1917 and 1918.

(b) The agents brought about the treatment of seed oats to prevent smut, from which were seeded 1,842,061 acres. The average increase in yield on demonstration areas was more than three bushels per acre due

to treatment, secured at an expenditure of less than 10 cents per acre.

(c) Families numbering 239,030 were assisted in home gardening and 151,532 laborers were located or supplied to farmers.

(d) As a result of special campaigns conducted by agents, 2,517,036 additional head of live stock were raised on farms. In order to improve the live stock, 34,037 head of registered animals were secured or located for farmers.

(e) Agents influenced the vaccination of 380,264 animals for blackleg and 523,189 hogs for cholera.

(f) The marketing of farm products has been given special attention by the agents in the Northern and Western States, resulting in 218 public markets being established in 1918. The value of products sold at these markets amounted to $14,205,210. During 1918, 2,404 exchanges and other cooperative purchasing and marketing associations were organized, which, together with those organized in previous years with the assistance of agents, did a business amounting to $41,-877,783, effecting a saving to the farmer of $3,307,-783.

8. The work of the nearly 1,800 home demonstration agents is quite as varied as that of the county agents. It includes:

(a) Demonstrations in food conservation, particularly canning and drying in the summer.

(b) Demonstration in poultry raising, egg marketing, butter making, preparation of food for the table, bread making.

(c) Encouraging the use of homemade labor-saving devices.

(d) Aid in establishing rest rooms for farm women in towns.

(e) Aid in establishing community canning and drying enterprises.

(f) Instruction in the conservation of clothing, fuel, health, and income.

9. As an example of the work done among women and girls last year, the canning effort may be cited. Federal and State leaders and agents taught 5,000,000 women and girls to can and dry vegetables and fruits

who, under instruction, canned over 100,000,000 containers of fruit and vegetables.

10. Home demonstration work was established in cities in 1918 with most encouraging results. During the war, food conservation assumed unusual importance, and it was felt that especial instruction should be given on this matter in the large centers of consumption. The activities of the city home demonstration agents included:

(a) Demonstrations in the use of wheat, sugar, and fat substitutes and the conservation of clothing.

(b) Demonstrations in canning, drying, and preserving of foods.

(c) Training volunteer leaders to give demonstrations in the making of war breads and the conservation of food.

(d) Preparing food exhibits for store windows, fairs, food shows, etc.

(e) Helping to organize community canning kitchens, war kitchens, and Liberty bread shops.

(f) Cooperation with home economics teachers of the public schools, etc., in teaching efficient use of food, clothing, fuel, etc., to community groups.

(g) Cooperation in training grade teachers for volunteer work as demonstrators in factories, foreign settlements, etc., as food and clothing demonstrators.

(h) Arranging meetings for foreign-born women in homes and settlements for instruction in the making and use of American foods.

(i) Working with retail and wholesale food dealers for the purpose of utilizing surplusages of abundant and locally grown foods and conserving those needed abroad or in the army.

(j) Advising with army cooks in near-by cantonments.

11. In boys' and girls' club work, the youth of the country has been interested and trained in better agriculture and in home making.

(a) More than 800,000 boys and girls in the Northern and Western States were enrolled in food-producing and industrial clubs last year. An idea of the contribution which the club workers made to the Nation's

food supply may be gained from the reports of 250,000 who sent in returns from their work. These reports show a production of 314,000 bushels of corn; 650,000 bushels of potatoes; 170,000 pounds of beans; garden produce, valued at $1,700,000; 133,000 jars of jellies; 1,900,000 quarts of fruit, vegetables, meats and soups; 22,000 tons of sugar beets; 330,000 chicks; 135,000 dozens of eggs; 24,500 hogs; 1,000 baby beeves; 8,000 sheep; 2,475 calves; 200,000 loaves of bread; and other products. Other clubs of smaller enrollment included onion clubs, butter clubs, cow-testing and dairy record clubs, sweet-corn clubs, wheat clubs, and home-yard clubs. The value of food produced per individual member reporting was $24.00, while the cost of the club work was only $1.05 a member enrolled.

(b) In the South, 410,000 boys were reached and helped in food and feed production through instructions given by agents in schools and community clubs, demonstrations, and so on. It is estimated that the value of food and feed produced by club members last year was $12,000,000. Corn produced by the regular club members totaled 530,000 bushels; peanuts, 39,000 bushels; potatoes, 29,000 bushels; wheat, 6,300 bushels; pork, 3,000,000 pounds; beef, 225,000 pounds; poultry, 135,667 fowls; pigs (breeding project), 30,000; dairy calves, 112; sheep, 104; cotton valued at $180,000; miscellaneous products valued at $185,000. Negro boys in the "farm-makers" club produced material worth $520,000.

BUREAU OF PLANT INDUSTRY

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1. In general, has aided farmers in every section of the country to increase production by

   (a) Development of new cultural methods.

   (b) Introduction of new crops and improved varieties of existing crops.

   (c) Combating the destructive plant diseases.

2. Through the Committee on Seed Stocks, seed was purchased and sold to farmers, in sections where an emergency in the supply existed in 1917 and 1918, in a sufficient quantity for planting approximately 1,200,000 acres. This included seed of sorghums for Texas, Oklahoma, and Kansas, barley and oats for North Dakota and Montana, and seed corn for the nothern part of the corn belt. The early frosts and freezes in the fall in 1917 injured the germinability of seed corn to the extent that a very serious shortage of locally adapted seed resulted. Through the efforts of the Committee on Seed Stocks good seed was made available and sold to farmers for planting approximately 500,000 acres.

3. Developed, in cooperation with other bureaus of the Department and with State agricultural representatives, a war food production program for the Nation, the definite recommendations of which were carefully determined and were calculated to maintain a well-balanced agriculture during war time.

4. Is conducting an intensive campaign to eradicate the common barberry, which harbors black or stem rust of wheat and other cereals in the States of Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Nebraska, North Dakota, South Dakota, Montana, Wyoming, and California.

5. Has conducted, since 1915, a successful campaign for the eradication of citrus canker, a serious disease in the Gulf States -- the first instance of the use of Federal funds appropriated specifically for the eradication of a plant disease. Canker has been practically eradicated from Florida and South Carolina.

6. Has conducted since September 1, 1917, to June 30, 1919, in cereal-producing States a campaign against the destructive smuts of cereal crops. It consists in instruction and actual demonstration of seed treatment and in getting farmers and school boys to perform experiments in seed treatment of cereals under supervision of an instructor. Is followed by field survey of fields from treated and untreated seed, to determine percentage of smut.

7. Devloped varieties of cotton suited to the irrigated sections of the Southwest and established a cotton industry in that region now involving 150,000 acres. Some 85,000 acres are devoted to the production of American Egyptian cotton, a high-grade, long-staple type largely imported from Egypt.

8. In 1915 and 1916, arranged for the importation of sugar-beet seed in time for planting, to meet the emergency caused by the war interference with the commercial movement from Germany, Austria, and Russia.

9. In 1915, through the State Department, obviated interference with imports from Mexico of binder twine fiber needed for handling the huge grain crop then coming to harvest.

10. Aided the hemp and flax industries by the development and introduction of better varieties for fiber purposes.

11. Made possible larger yields and better grades of corn over a wide territory by the introduction of improved varieties.

12. Through its New and Rare Seed Distribution, the Bureau has distributed annually for the past three years approximately 200,000 packages of field seeds. This distribution has for its object the dissemination of new and rare crops, improved strains of staple crops, and high-grade seed of crops new to sections where the data of the department indicate such crops to be of considerable promise.

13. During the past five years, has distributed annually an average of 12,000,000 packages of vegetable and flower seed.

14. Under special appropriation by Congress in 1916, distributed seeds to provide food for 21,000 destitute families and feed for their animals in the flood areas of North Carolina, South Carolina, Georgia, Alabama, Florida, Tennessee, and Mississippi.

15. Hemp seed of strains improved by selection was distributed to hemp-seedgrowers, producing better crops of seed and fiber. This, with higher prices for fiber, resulted in increasing the hemp acreage from four thousand acres in 1914 to forty thousand in 1917.

16. At the request of the Expeditionary Forces in France, secured and submitted sample bales of saw palmetto leaves and Florida moss for use by the Camouflage Corps.

17. Special attention devoted to the maintenance of a large supply of pure planting seed of American Egyptian cotton in the irrigated districts of Arizona and California as a part of the campaign to maintain the production of long staple cotton of a quality suitable for use in the manufacture of automobile tires and of airplane, ballon and gas-mask fabrics.

18. Considerable work has been done in assembling the data in regard to the botanical resources of Africa and in preparing a map of that continent showing the principal zones of natural vegetation as indicating the crop capabilities of the different portions of Africa, for use at the Peace Conference. A member of the Bureau's staff visited Algeria during September and October to ascertain the conditions of food production in that colony and in what manner the U. S. Department of Agriculture could cooperate towards increasing or stabilizing such production.

19. Established cooperative relations with the Food Products Inspectors of the Bureau of Markets, to the end that the heavy losses suffered by the farmers due to the deterioration of vegetables in transit to market may be prevented.

20. Inaugurated pathological extension work in the various States, in cooperation with the State extension organizations, for the control of diseases of cotton, truck, and forage crops.

21. Undertook investigations of the pathological defects of airplane timber with a view to eliminate defective material in logging and milling operations and to avoid the necessity of frequently discarding finished material.

22. At the request of the War Department, undertook the development or modification of the methods of preventing sap stains and molds in lumber in order to devise a method applicable under the conditions of gun carriage manufacture. These investigations were conducted in cooperation with the Forest Products Laboratory of the Forest Service.

23. Cooperated with the War Department in securing the production of castor beans to supply large quantities needed in the manufacture of castor oil for lubricating aircraft engines. Also collaborated on the technology of the manufacture and refining of the oil and in the planning and installation of a castor-oil mill at Gainesville, Florida.

24. Experiments made at irrigated field stations show the value of farm manure in increasing the yields of potatoes and sugar beets grown under irrigation.

25. Cooperation has been encouraged among farmers on Reclamation Projects for the purpose of utilizing the range lands in the National Forests.

26. Successful demonstrations of methods of utilizing irrigated crops in pork production has stimulated this industry on Reclamation Projects.

27. Demonstrations of methods of establishing mixed grass pastures on irrigated land as a means of increasing the efficiency of dairy-

ing on Reclamation Projects.

28. Studies of the improvement of citrus orchards through the use of bud wood from productive trees bearing fruit of good quality.

29. Improvements in the cotton industry are being carried forward, superior varieties acclimatized, spread and distributed, and community production of adequate supplies of pure seed established. The Lone Star cotton has gone rapidly into production and has now become one of the most prominent varieties in Texas and adjacent States. Meade cotton, a new long-staple Upland variety, with fiber of Sea Island length and quality, is being substituted extensively for Sea Island in Georgia on account of early maturity and larger crops under weevil conditions. Earlier and larger crops are being secured through improved methods of culture.

30. Rhodes grass, recently introduced by the Bureau, has grown rapidly in popularity in Florida and southern Texas. In the latter State, very large areas of land, both irrigated and nonirrigated, have been planted to this grass.

31. Sudan grass, introduced by the Department and first distributed in 1912, has proved remarkably successful as a hay crop in the Middle and Southwestern States, and the acreage now planted is very large.

32. Tests of the Chinese dry-land elm (Ulmus pumila) carried on at Mandan, North Dakota, have shown this tree to be exceptionally well adapted both to the climatic and soil conditions of this region, and it is believed that this species will become a valuable shelter-belt and ornamental tree for the northern plains region.

33. Several details in regard to the control of fruit diseases by spraying and dusting have been worked out or brought to practical conclusion during the past year.

34. Definite recommendations for spraying based on definite results from experiments have been worked out on the cherry leaf-blight on both sweet and sour cherries and a Farmers' Bulletin issued outlining the treatment.

35. Dusting of peaches with the superfine sulphur-lime dust has been proved to be equally as effective as spraying with self-boiled lime-sulphur when applied on the same schedule; to require about one-third of the labor but a greater quantity of material. Dusting has been demonstrated to be ineffective against apple-scab and leaf-spot.

36. A field method of testing the persistence of copper spray coatings on the foliage of various fruits has been worked out and a bulletin published. By this method it is possible to determine how much of the spray material has been washed off and how soon additional treatments are required.

37. Definite progress has been made in the control of apple diseases in cold storage; practical methods of reducing or controlling the amount of barrel scald in apples by ventilation of packages and storage rooms or by the use of the right type of wrapper have been discovered.

38. Pathological inspection of fruits on the terminal markets has been organized during the year, in cooperation with the market inspection service of the Bureau of Markets, resulting in correct diagnosis of the nature of the diseases and injuries in most cases of spoilage of fruits in transit, in storage, and on the markets.

39. Definite progress has been made in studies of the causes of spoilage of cranberries in storage, in transit, and on the markets. The newly discovered facts, together with the results of field spraying experiments and laboratory life history studies, have been prepared for publication as a Farmers' Bulletin, giving definite directions for controlling these troubles.

40. Velvet bean production was furthered by the introduction of a number of new varieties. Since 1915, the culture of this crop has increased with remarkable rapidity, due to the appearance of early sports of the Florida variety which have been fostered by the Bureau. From 1,000,000 acres in 1915, velvet bean culture has extended to an estimated area of 12,000,000 acres in 1919.

41. Soy bean culture has steadily extended and has been greatly stimulated by the work of the Department in distributing superior new varieties.

42. Napier grass, introduced by the Department in 1913, has already become important and is a highly valuable forage crop wherever citrus can be grown.

43. The great extension of sorghum culture, particularly in the dry regions of the West, has largely been due to the activities of this Bureau through its studies of methods of culture and particularly by the development and introduction of new superior varieties.

44. Peruvian alfalfa was introduced in 1899. It is a variety of high importance in the Southwest and seems destined to replace other varieties on account of its greater yield.

45. Brabham, Monetta, and Victory cowpeas, all resistant to nematodes and wilt, have been developed or fostered by the Bureau and are now the most important varieties in the Southwest.

46. A plant-disease information service, by which plant pathologists have been kept posted on disease conditions in various parts of the country, was conducted during 1917 and 1918 and is being continued in 1919.

47. A survey of cornfields was made to learn facts concerning the distribution, importance, habits, etc., of brown spot, a threatening disease of corn. As a result of this survey, it was found that the disease was already widely distributed, that it had probably reached its limit of spread, and that it was not likely to become a serious disease in the great corn States, and much information useful in the investigation of the disease was obtained.

48. Field surveys were made to learn facts concerning root rots or corn and leaf rusts of small grains. The information obtained was used by the investigators of these problems.

49. An effort has been made to learn the geographical range of a newly discovered and serious disease of wheat caused by nematode, It has been determined that the disease occurs principally in Virginia but also in Georgia, Maryland, and West Virginia. As a result of this information, control campaigns are being pushed in regions where the disease occurs.

50. Among the ten thousand new and useful plants which the Office of Foreign Seed and Plant Introduction has brought in and which are now growing in the country may be mentioned a remarkable collection of Guatemalan avocados, which are hardier than the West Indian varieties; a collection of the blight-resistant pears of China, the Fuyu persimmon of Japan, which is without astringency; the edible fruited oak of China; a collection of the most beautiful of the Japanese flowering cherry trees; the Chinese grafted jujubes, a fruit tree of which small orchards are already planted in Texas and California; the Quaensland nut, a new table-nut tree from Australia; the blight-resistant Chinese chestnut trees; a promising late clingstone peach from China, and a new Brazilian forage grass. The putting of the dasheen on a commercial basis as a new root crop for the South and the establishment of the adaptability of the Oriental bamboo as a timber and vegetable crop from the Carolinas to the Gulf have been accomplished during the past five years.

51. During the spring of 1919, specialists were assigned to assist in the campaign for increasing the acreage of nonirrigated rice in the southeastern United States, of grain sorghum in the drier portions of the southern Great Plains area, and of flax in the northern Great Plains; and to stabilize the acreage of barley in the Upper Mississippi Valley, where barley is both profitable and important in rotation but where the continuance of barley growing was rendered somewhat doubtful by the reduction of milling demand and the actual and prospective reduction of brewing demand.

52. A specialist was assigned to the nothern districts in the application of the President's Seed Loan Fund from August 1, 1918, to the fall of 1919, supervising the placing of loans and adjusting claims arising from crop failure.

53. The discovery of the Australian wheat disease known as "take-all" in Madison County, Illinois, in April, was made the subject of immediate investigation. Specialists were sent to study the disease, and a large number of pathologists representing the principal cereal-growing States were brought to Illinois to become personally familiar with take-all and with the Australian flag-smut, which was discovered in wheat fields in the same county. Widespread publicity was given to these discoveries and a prompt survey made of all districts in which suspicious wheat diseases were reported by county agents and others. As a result, take-all has been located in three counties in Illinois and in three counties in Indiana, while flag-smut has not yet been found outside of Madison County, Illinois. The investigation will be vigorously continued.

54. Work is carried on with all of the more important fruits grown in the United States, including studies of the cultural requirements under varying conditions in different parts of the country.

55. Studies are made in the improvement of rosaceous fruits, particularly peaches and pears, by breeding, and of citrus fruits through bud selection, for the purpose of developing varieties better adapted to certain regions where the climatic and other conditions are adverse to varieties now available

56. Breeding work with muscadine grapes is carried on for the purpose of developing varieties producing fruit in larger sized clusters, as well as fruit of better dessert quality and better adapted for use in the preparation of unfermented juice, jelly and other products.

57. Utilization investigations are carried on with a view to meet farm conditions and to develop means, methods, and equipment whereby farmers can profitably utilize portions of their crops which can not be marketed profitably in the fresh state. This work includes the drying and canning on the farm of many fruits and the making of unfermented fruit juices and other fruit products.

58. Investigations are conducted to determine the response of different fruits, which have been grown, picked, and handled under varying cultural conditions, to different storage conditions as to temperature, humidity, etc.

59. An extensive study of named varieties of pecans, including their relative merit, range of adaptability, and commercial qualities and characteristics, has been made with special attention to cultural requirements and to the determination of the best cultural methods and practices.

60. Work is being done with vegetables along substantially the same lines as the production investigations relating to fruits. Particular attention is given to important truck crops which present special cultural problems. The response of different vegetables

to different fertilizers under certain conditions is receiving attention, as is also the growing of peas for canning purposes. A study of sweet potato varieties is in progress.

61. Special consideration is given to Irish potatoes, including methods of culture in different important producing regions, the development of new varieties better adapted to different purposes and possessing a high degree of disease resistance. Special attention is given to the improvement of seed potatoes with a view to develop higher yielding strains, and strains of greater purity and to bring about the production of seed supplies free from disease.

62. Standardization of different kinds of vegetables, particularly cauliflower and lettuce, is in progress, this work involving a careful selection of seed stocks through a series of generations. The improvement of tomatoes by breeding and the development of disease-resistant beans through selection represent other important activities.

63. Investigations relating to the utilization of vegetables are carried on along lines parallel to the corresponding work with fruits, with special attention to the storage of celery, cauliflower, and some other vegetables not previously held in storage extensively on a commercial basis.

64. Work with ornamental plants has been conducted principally in connection with landscape gardening projects. Studies also have been made of practically all the different varieties of roses and peonies in the American trade with a view to determine varieties best adapted to growing under varying conditions in different parts of the country. A study of Japan irises is under way, also extensive investigations of bulb culture with a view to develop bulb-production industries whereby the bulbs now imported may be produced domestically.

65. In cooperation with the Extension Offices of the States Relations Service, extension activities along horticultural and pomological lines are being carried on in different States.

BUREAU OF ENTOMOLOGY

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1. In general, the work of the Bureau of Entomology consists in

   (a) Investigations of the life histories and habits of insects injurious and beneficial to agriculture, horticulture and other crops and products, and forest and shade trees;

   (b) Investigations of insects affecting the health of man and domestic animals;

   (c) Ascertaining the best means of destroying injurious insects;

   (d) Work in systematic entomology.

2. Prevented large losses to the wheat crop of 1915 by foreseeing the great wave of Hessian-fly infestation which spread over the wheat belt, by distributing broadcast warnings and definite information on how best to avoid the ravages of the pest.

3. Investigations have resulted in complete success in adjusting and applying poison baits for the destruction of injurious grasshoppers, effecting a saving of many thousands of dollars by the protection of forage crops.

4. By means of proper preparation and application of baits against cutworms, forage crops, particularly alfalfa, have been saved to the extent of many thousands of dollars.

5. Developed special mechanical methods of attacking a dangerous and newly discovered pest of corn and other crops - the European corn borer.

6. Developed control measures for the potato tuber moth in the Pacific Coast States whereby losses from this insect have been greatly reduced.

7. Developed remedies for the most important insect enemies of the sugar beet, especially wireworms, webworms, and leaf-hoppers, with material benefit to the industry.

8. Developed and demonstrated satisfactory control of the onion thrips and melon aphis by means of nicotine sulphate and special spraying devices.

9. Determined remedial measures for protection of truck crops from cutworms.

10. Methods have been developed in the cultural control of the sweet-potato weevil which will insure the profitable commercial growing of sweet potatoes in the heavy sweet-potato producing belt in the South.

11. Established with marked success, leading to the almost complete control of plant lice, a colony of beneficial ladybird beetles in Tidewater Virginia.

12. Developed the use of powdered arsenate of lead as a satisfactory dry poison for tobacco hornworms, cotton worms, and other insects.

13. Perfected measures for the mitigation of the boll weevil of cotton, which work has influenced to an important extent agricultural practices in the South.

14. Progress has been made in the development of control methods for the sugar-cane borer.

15. Marked success has followed efforts to retard the spread of the gipsy moth.

    (a) The infested area (18,633 square miles in 1914) has been held to an area of 21,998 square miles for 1918.

    (b) Numerous parasites and predatory enemies of the gipsy and brown-tail moths, introduced from various parts of the world, already have proved to be factors of great importance in the control of these insects.

16. Developed effective measures for the control of citrus-scale pests and the orange white fly in Florida by the use of appropriate sprays.

17. Perfected a spraying schedule for orange groves, which is now in large use by growers.

18. Has made improvement in the utilization of hydrocyanic-acid gas for the control of mealy bugs and other scale insect pests in citrus orchards of southern California.

19. Has accumulated information on the Mediterranean and other fruit flies in Hawaii and elsewhere, which will be of the greatest value to fruit growers of the United States should these insects ever become established in this country.

20. Determined effective and satisfactory control of the grape berry moth and recommended a spray schedule to grape growers.

21. Developed remedies for many of the pecan insects in the South, resulting in material benefit to the pecan industry.

22. Investigations of the codling moth in different parts of the country have furnished a large amount of data, which will be used in formulating a spray schedule effective under the respective climatic and other conditions of the apple-growing regions.

23. Has conducted demonstrations on a large scale in the South to instruct farmers in the prevention of weevil injury to stored grains.

24. Has rendered assistance to mill men in the protection of mill products from insect attack.

25. Cooperates with the War Department to prevent insect damage to military supplies and stored products.

26. Has demonstrated the practicability of preventing huge losses by insects to foodstuffs stored in warehouses throughout the country.

27. Has aided in experimental work to prove the value of electricity as a control agent in lessening damage to cereal products in package form and in sterilizing grains in bulk.

28. Has conducted a Nation-wide campaign to increase honey production to help meet the shortage in the supply of sugar.

29. Has worked out numerous problems of the beekeeper relating to the better care of bees during the winter, the utilization of adequate hives, and the detection and treatment of bee diseases.

30. Developed satisfactory treatment of manure to prevent fly breeding.

31. Demonstrated a new mosquito carrier of malaria.

32. In a specific study of the economic importance of malaria in the South and the losses to the planter resulting from invalidism due to this disease, it was learned that there was an annual loss of about $6 an acre attributable to malaria.

33. Developed methods by which Dendroctonus beetles, which constitute a serious menace to standing pine, spruce, and Douglas fir timbers of the Rocky Mountain and Pacific Slope States, have been shown to be controllable to a large degree. The work done in the Yellowstone National Park during the last three years has resulted in almost complete elimination of these beetles in yellow pine and sugar pine.

34. Operations carried out on Long Island, New York, against the hickory bark beetle and the two-lined chestnut borer in oaks apparently have resulted in a great reduction in the numbers of these two pests, which are threatening the hickories and oaks of this island.

35. Fifty specialists in 33 States, cooperating with the State agricultural colleges, are explaining and demonstrating to farmers, fruit growers, live-stock men, and others in various parts of the country methods of reducing insect losses.

36. The Bureau frequently is called upon to undertake special work in connection with the eradication or survey of recently introduced pests. It is now engaged in

(a) Determining the distribution in the South of the sweet-potato weevil;

(b) Ascertaining the distribution and injuries of the Oriental peach moth;

(c) Determining the distribution and injuries of the European cornstalk borer;

(d) Eradication of the Japanese beetle;

(e) Eradication in Texas of the pink bollworm;

BUREAU OF ANIMAL INDUSTRY.

1. In general, the major efforts of this bureau, intensified during the last two years to meet war needs, have been directed toward

   (a) Stimulating the production of meat, dairy, and poultry products;

   (b) Utilization of these foods in the most economical ways;

   (c) Suppression of animal diseases, which cause an estimated loss of $212,000,000 annually;

   (d) Investigating the wisest use of available feedstuffs for live stock;

   (e) Encouraging the more general raising of farm animals.

2. Conducts the Federal meat-inspection service, which not only protects the civilian population of the United States and foreign countries from diseased or otherwise faulty meat and meat products, but guards especially the food of our soldiers and sailors. This service now covers about 66 per cent of the meat and meat products produced in the United States, at a cost to the public, per animal slaughtered, of about 5½ cents.

3. In 1914-16 eradicated within a comparatively brief period the most serious outbreak of foot-and-mouth disease that ever appeared in this country--a feat that in its magnitude has never been duplicated by any other nation.

4. In 1916 and 1917 caused the early disappearance of another dreaded animal plague, vesicular stomatitis, which broke out among thousands of horses collected for exportation for military purposes.

5. Eradicated since March, 1913, the cattle fever tick from 290,815 square miles in Southern States, forcing a tick-free wedge to the Gulf of Mexico, enabling this immense area to begin to do its full share in meat production, and making a total of 458,529 square miles released from quarantine since the campaign began in 1906, which is over 63 per cent of the total area quarantined.

6. Freed since January 1, 1914, 468,277 square miles from sheep scabies and 177,729 square miles from cattle scabies.

7. Worked intensively for the control of hog cholera, the greatest impediment to hog production, in 34 States, saving great sums to the swine industry and stimulating increased production. During last year the losses of swine were the lowest in 36 years.

8. Worked to minimize enormous losses from influenza or shipping fever among horses, especially among animals shipped for war purposes.

9. Sought a method of curing or preventing contagious abortion among cattle, under an appropriation allowed by Congress in 1917.

10. Is operating in 40 States to eradicate tuberculosis among cattle.

11. Conducted beef-cattle experiments and demonstrations as relating to economic methods of feeding and management and the utilization of such feeds as would make it possible to save grain.

12. Carried out extensive demonstrations of improved methods of cattle raising and dairying in the South as part of a program to encourage well-balanced farming.

13. Worked for the development of cow-testing and cooperative bull associations in various parts of the country.

14. Gave advice and assistance in the construction of thousands of silos and hundreds of barns.

15. Helped to develop better methods in the manufacture of butter and various kinds of cheese.

16. Aided more than 100 creameries to more efficient operation and utilization of by-products.

17. Cooperated with approximately 100 cities in improving their milk supply, and with the Public Health Service and the War and Navy Departments toward insuring safe and sanitary dairy products for army cantonments and naval stations.

18. Conducted active work, in cooperation with the extension service, to develop pig clubs among children. There are at present 81,074 boys and girls in 44 States to whom have been demonstrated the value of pure-bred stock and proper care, feeding, and management of swine.

19. Encouraged poultry raising through the organization, in cooperation with the States Relations Service, of 31,095 children in 10 States as members of boys' and girls' poultry clubs and stimulated poultry raising by general farmers and in urban back yards. The total value of the poultry and eggs produced by boys and girls for the year 1918 amounted to $403,690.46.

20. Organized campaigns for producing infertile eggs, thereby saving great loss from spoilage, and for culling out slacker hens from flocks.

21. Conducted special campaigns to enlarge the production of hogs and poultry, which yield quickest returns.

22. Advocated careful and intelligent feeding, to save food suitable for human beings and provide a use for products otherwise wasted.

23. Encouraged sheep raising for mutton and wool.

24. Made special efforts to increase beef production and aid breeders in procuring and placing breeding stock, with emphasis on the advantages to the general farmer of raising more animals.

25. Conducted campaigns for greater production and fuller utilization of milk and other dairy products, the cottage cheese propaganda being an example of how a largely wasted food, skim milk, can be made to play an important part to meet war-time needs.

BUREAU OF MARKETS.

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1. Originally established by the present Administration as the Office of Markets and Rural Organization to aid the half of American Agriculture embraced in the marketing of farm products, rural finance, and rural organization, this office in 1917 had grown to such proportions that it was designated the Bureau of Markets. The aid it has accorded to producer and consumer in the solution of problems in distribution and marketing gave it a most important part to play in war-time food problems.

2. The work of the Bureau is of three types:
   (a) It secures and disseminates useful information concerning the marketing and distribution of farm and nonmanufactured food products.
   (b) Renders service by means of market news reports, reports of certain products in cold storage, and the market inspection service.
   (c) Enforces Federal laws as to cotton futures, grain standards, warehouse practices, and standard containers.

3. Growers and shippers are encouraged properly to grade and pack their products in order that they may be marketed economically and efficiently.

4. The Bureau has determined and recommended specifications for United States grades for potatoes, Bermuda onions, and strawberries, and tentative grades for apples, sweet potatoes, and tomatoes.
   (a) The potato grades were approved and promulgated by the U. S. Food Administration, their use by licensed dealers being made compulsory during the operation of food control act.
   (b) The Federal Reserve Board also authorized member banks to make loans against warehouse receipts for potatoes, properly graded, packed, stored, and insured. Potatoes graded in accordance with the Department's recommended grades meet these requirements.

5. Fixed and uniform standard containers for fruits and vegetables have been developed in order to facilitate the handling and marketing of these products, prevent loss in transit, and prevent fraudulent practices.

6. Nation-wide food surveys have been made. They are the first stock-taking inventory of our Nation's supply.

7. City authorities have been assisted in solving local marketing problems.

8. Aided in disposal of surplus products from war gardens.

9. Fostered marketing by parcel post and by motor trucks.

10. Has given particular aid in marketing and creating a demand for dairy products.

11. Has helped in the establishment of public markets.

12. Aided cooperative organizations.
    (a) Gathered and made readily available information on cooperative rural credit associations, farmers' mutual insurance companies, and rural telephone organizations.
    (b) Helped in devising accounting methods and business practices for farmers' cooperative organizations, such as creameries, fruit and vegetable growers' associations, grain elevators, and the like. More than 1,000 organizations use the uniform accounting systems that have been devised.

13. Has taken up rural organization questions, making studies of the best types of activities and offering suggestions for their creation or development elsewhere.

14. Issues market news reports covering all the more important crops, giving daily to quarterly returns. The machinery of the Bureau is in active operation 24 hours every day, six days in the week. It adapts itself to the hours of the trade in the large cities and to the mail schedules of the specific rural communities where its representatives are located. It records actual facts and quotes actual prices, and in each phase of this service it is excelling any service ever before rendered in the same field. These news services are conducted by telegraph, and over 14,000 miles of leased wires are used 12 hours in every 24. Over 1,000 railroad superintendents assist in this work by reporting daily by wire the number of cars and destinations of live stock, fruits, vegetables moving from their divisions.
    (a) Daily services on truck crops and fruits have helped buyers and sellers to agree on fair prices based on accurate knowledge of supplies and shipments.
    (b) Has helped the housewife to know what fruits and vegetables were being received in large quantities and which therefore were likely to be low in price. All this has helped to equalize and stabilize prices and to affect in a similar way the flow of commodities.
    (c) Has rendered important service with its daily meat reports and the reports on cattle loaded for shipment, in transit, and received at principal markets.
    (d) Issues bi-weekly reports on honey and on hay.
    (e) Monthly reports of stockyard receipts.
    (f) Monthly reports of seed stocks and of cold storage holdings.
    (g) Quarterly reports of the wool supply.

15. The Food Products Inspection Service maintains offices in 29 important central markets where shipments of fruits and vegetables are inspected by experienced, trained men, and inspections are made in 143 additional cities by inspectors located at the established offices. Thousands of carloads of perishables over which there was controversy between grower, shipper, receiver or other interested parties have been inspected and adjustments made on the basis of the certificates of the Department, thus
    (a) Expediting the movement of these products into consumption.

(b) Relieving congested transportation facilities.
(c) Avoiding great waste of food which often has occurred in the past.
(d) Saving thousands of dollars to interested parties from the grower to the consumer.

16. In regulatory work, has enforced three important Federal statutes -- the Cotton Futures Act, the Grain Standards Act, and the Standard Container Act, and administered the Warehouse Act.

17. Under the Cotton Futures Act standards were established by the Department of Agriculture for nine grades of cotton deliverable on future contracts. Standards were also established for tinged and strained cotton of the above grades. The amendment of March 4, 1919, to the Cotton Futures Act allows only the following grades to be be delivered under new style future contracts:Middling fair; Strict good middling; Good middling; Strict middling; Middling; Strict low middling; Low middling; Good middling yellow tinged; Strict middling yellow tinged; Good middling yellow stained. Since April 30, 1919, trading in old style future contracts has been prohibited except for the purpose of liquidation.

(a) Act provides for the determination of disputes by the Department of Agriculture for cotton delivered in cases where the complainants and respondents do not agree as to the grade of cotton offered for delivery.
(b) Received 1,904 disputes from the New York Cotton Exchange and 35 from the New Orleans Cotton Exchange since the Act became effective in February, 1915.
(c) During the year 1918-1919, 451 disputes, involving 25,929 bales, were heard, as compared with 182 disputes, involving 10,104 bales in 1917-1918.
(d) The cotton standards have been generally adopted by the cotton markets and by the trade not only in this country but abroad, notably by the Rotterdam Cotton Exchange.

18. Established, under the United States Grain Standards Act, official grain standards of the United States for shelled corn, wheat, and oats.

(a) For the effective enforcement of the Act, the United States has been divided into 35 supervision districts, with an office of Federal Grain Supervision as headquarters for each district.
(b) Through the offices of Federal Grain Supervision, the inspection and grading of grain and the uniform application of the grades are carefully supervised.
(c) Has rendered much assistance to the members of the grain trade, to grain inspectors, and to the grain inspection departments with regard to the proper method of procedure employed in the sampling, testing, and grading of grain.
(d) New and improved laboratory equipment has been developed for work in determining the correct grade of grain, and such equipment has been very generally adopted by the grain trade.

(e) Since July, 1918, a series of grain grading exhibits has been held for the purpose of demonstrating to grain dealers, millers, ers, and farmers the application of the Federal grades.

19. Much assistance and cooperation have been rendered the Food Administration Grain Corporation and various branches of the War Department with respect to their problems having to do with grain inspection, grain transportation, and grain grading.

20. Under the Warehouse Act, rules and regulations have been drawn up with the cooperation of warehousemen, insurance men, bankers, and representative banking companies. Receipts covering standard products issued by a licensed warehouse company become as good as money in hand.

21. Activities have been conducted to lessen the enormous losses and waste in connection with the marketing of cotton seed and its products. Better storing, handling, and marketing methods have been demonstrated with a view to improve the quality and increase the quantity of cottonseed products.

22. Regulations for the enforcement of the Standard Container Act were promulgated, and package manufacturers and produce shippers have been advised of requirements of this law through personal visits of Department representatives at factories, in shipping sections, and at public meetings. Without working hardships on the interested parties the law:

(a) Eliminates from the markets many unstandardized containers.
(b) Makes possible more satisfactory handling and marketing of fruits and vegetables.

BUREAU OF CHEMISTRY.

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1. The Bureau of Chemistry has enforced the Food and Drugs Act, prohibiting the adulteration and misbranding of food and drugs when shipped in interstate commerce; the Sherley amendment to the Food and Drugs Act, prohibiting manufacturers from making false and misleading claims as to the efficacy of patent medicines; and the Net Weight amendment, requiring an accurate statement of the quantity of the contents of foods in packages.

   (a) Swindling has been prevented in large measure without unnecessary interference with the food industry.

   (b) Interstate traffic in unwholesome food and drugs has been prevented through improved systems of inspection and analysis and by means of effective prosecutions and warnings.

   (c) The deterrent effect of this act on unscrupulous dealers has been greatly increased, and much has been done to relieve honest producers from the unfair competition of adulterated foods and drugs through the publication of the Service and Regulatory Announcements and through widespread communication of decisions, rulings, and results of prosecutions to the public.

2. It has given active assistance and cooperation to manufacturers and handlers of food by helping them to avoid waste and spoilage, save valuable by-products, and ship certain perishable foods so as to arrive in good order.

3. It has greatly assisted the naval stores industry through the development of permanent and standard type samples for use in grading. These samples have been widely adopted for the naval stores industry and have resulted in eliminating some of the inequities in dealings in these products.

4. It has devoted a great part of its work to purely war-winning ends. Much has had to do with foods and the relative nutritive value of several substitutes for foods which were relatively scarce. Conservation of foodstuffs also has been demonstrated.

5. It has made important analyses of food and drugs for other departments of the Government, particularly the War and Navy Departments.

6. It has obtained many valuable data regarding the effect of variations

in seed, climate, and soil on the chemical composition of the varieties of wheat and grain sorghums. Information has been obtained as to the effect on the crop and its composition of the application of the various constituents of fertilizers at different stages of the crops' growth.

7. It has obtained valuable information regarding the effect which variations in the composition of leather and of tanning materials have on the wearing qualities of leather. Methods for determining the composition of leather and of testing its wearing qualities are being worked out. This work proved of great value to the War Department in making specifications for shoes for soldiers.

8. It has developed methods by which certain tannery wastes, which were not only lost but in many cases were a nuisance because of their pollution of streams, have been utilized profitably as fertilizers.

9. It is perfecting methods of tanning leather on a small scale for the use of the farmer and the small tradesman.

10. It has effected economies in the use of paper-making materials by showing that in many cases light-weight paper can be made to serve better than heavier paper.

11. It has developed simple and inexpensive methods, applicable to farm use, for both waterproofing and mildewproofing fabrics for wagon covers, tents, tarpaulins, and other uses. Started as a project primarily for the farmer, it developed information of great value to the War Department.

12. It has made much progress in developing methods for drying potatoes for stock feed and for preserving fruit juices. New methods for utilizing fruits and vegetables which are now wasted, either because of unsuitableness for food or because of overproduction, are being studied.

13. It has developed and demonstrated devices which will prevent the food and property destroying explosions of smut dust in thrashing machines. It is studying the physical and chemical properties of grain and other plant dusts which are thought to cause explosions in thrashing machines, mills, and elevators.

14. It has secured valuable results from investigations to develop new and cheaper methods for manufacturing dyes:

    (a) A new chemical process has been devised for the manufacture of phthalic anhydride, one of the most valuable compounds used in the manufacture of dyes. This process is now being tested on a large scale and promises to be the most economical

one ever used for this purpose.

(b) A new and valuable method for the production of chlor derivatives has been devised, and this process has been tried upon a large scale. The results show that the process is extremely practical and produces some valuable compounds, which are used in the dye industry in an economical manner.

(c) A process for the manufacture of indigo, some eight to ten million pounds of which ordinarily are consumed in this country annually, has been investigated with a view to its introduction into commercial practice.

(d) Fifteen patents covering new processes for the manufacture of dyes have been granted or applied for.

15. It has cooperated with the Post Office Department in the enforcement of the fraud mail order law in its application to drugs and medicines.

16. It has made progress in determining the cause of many fires in cotton gins and recommended methods which have been effective in preventing such fires.

17. It has analyzed a large number of samples for other bureaus of this Department in connection with agricultural projects.

18. It has developed and introduced improved methods for the production of rosin and turpentine.

19. It has studied improved processes for the manufacture of cane sirup.

20. It is studying the proteins of substances available for food and for stock feed.

21. It is investigating cheaper and better methods for the manufacture of insecticides.

22. It is developing commercial methods for the dehydration of fruits and vegetables.

23. It conducts investigations to determine suitable definitions and standards for foods and stock feeds.

BUREAU OF BIOLOGICAL SURVEY.

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1. The Bureau of Biological Survey has conducted a war on predatory animals, which destroy annually $25,000,000 to $30,000,000 worth of meat animals on the public lands in the West:

   (a) It has originated and developed an organization for the control of predatory animals through a force of about 300 hunters and trappers.

   (b) It has destroyed by trapping and shooting 87,430 wolves, coyotes, bobcats, mountain lions, and other stock-killing animals, and also has killed by poisoning great numbers of coyotes over extended areas.

   (c) In addition to effecting a large saving of cattle, sheep, goats, horses, swine, and poultry, it has also controlled the spread of rabies in five States and greatly reduced the danger to human life from this disease.

2. It has promoted extensive poisoning campaigns in many States for the destruction of ground squirrels and other rodents that cause losses to crops aggregating more than $150,000, 000 annually.

   (a) In North Dakota organized campaigns against ground squirrels, in cooperation with the State Extension Service, resulted in 1918 in the practical extermination of 95 per cent of the pests on 34,800 farms, representing 12,860,000 acreas, thereby effecting an estimated saving of more than $2,500,000 worth of crops. During 1918 more than 18,000 farmers cooperated in Montana in a similar campaign.

3. It has demonstrated effective methods of poisoning jack rabbits, which destroy large quantities of wheat, barley, oats, alfalfa, and other growing crops and stacked hay, and has organized campaigns in farming communities against these pests.

   (a) In one county in Oregon about 75,000 rabbits were poisoned during the winter of 1915-16 at a cost of less than one-tenth of a cent each.

4. It has developed a very effective poison with which it has prosecuted vigorous campaigns against prairie-dogs upon national forests and other public lands.

   (a) On seven national forests in the Rocky Mountain States prairie-dogs have been much lessened in numbers, thereby improving the range for live stock fully 50 per cent, according to an estimate of the Forest Service.

(b) On more than 3,000,000 acres, 90 per cent of the prairie-dogs were killed by the first poisoning, at a cost of 5 to 10 cents an acre. Where repoisoning was carried on, it resulted in the practical extermination of the pest.

5. It has undertaken a nation-wide campaign for the more adequate control of house rats and mice, notorious destroyers of field crops, stored products, and poultry. It is now working to acquaint the public with the seriousness of the losses and with simple and effective means of preventing them. Several States and many cities and communities are joining in this work.

6. It has established a fur farm to conduct experiments in raising fur-bearing animals, to be developed as an agricultural activity.

7. It has collected and published information on the distribution, abundance, and habits of birds and animals in various parts of the United States, this information being necessary in connection with the administration of Federal laws.

8. It has maintained five big-game preserves and 69 bird reservations.

9. It has reduced materially, through administration of the Lacey Act, interstate traffic in wild birds and game killed or shipped in violation of State laws.

10. It assisted in formulating the treaty between the United States and Great Britain for the protection of game and insectivorous birds migrating between the United States and Canada, a conservation measure of far-reaching importance, and administers the migratory-bird treaty act which protects by closed seasons migratory wild fowl, thus adding to the food supply by effecting an enormous increase in their numbers.

11. It has completed biological surveys in Alabama, New Mexico, North Dakota, Wyoming, and Oregon and made substantial progress in eight other States.

BUREAU OF SOILS

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1. The Bureau of Soils has made detailed soil surveys, during the past six years, in 383 areas, the unit of survey in most cases being an entire county. These areas are located in 40 States and embrace about 215,155 square miles. In addition, 18 reconnoissance surveys, covering a total area of about 118,072 square miles and including extensive areas in Alaska were made to determine their agricultural possibilities. The results of these surveys show the location of the soils and their usefulness to agriculture and are made available through printed reports and large colored soil maps. Nearly all this work is now done in cooperation with the various States. In addition, it has:

   (a) Classified, in cooperation with the Forest Service, several million acres of land in the National Forests.

   (b) Examined and passed on the agricultural possibilities of the land in about twenty cases of proposed extensions of irrigation projects for the U. S. Reclamation Service.

   (c) Studied and mapped in detail the soils and crops in the principal truck-growing sections of the Atlantic Coast north of Florida.

   (d) Cooperated with the War Department in the mapping of a number of areas in the Southern States having special importance to the War Department in the construction of a military map of the United States.

   (e) Cooperated with the American Geographical Society in compiling a soil map of Africa for the use of the Peace Commission.

   (f) Investigated, for the State Department, the soils in a zone 20 miles wide and 60 miles long along the boundary between Guatemala and Honduras.

   (g) Prepared for the War Department a soil map of the war zone in France.

   (h) Reported on the nature of certain lands tentatively selected for purchase by the Federal Board for Vocational Education.

2. It has made marked progress in the development of domestic sources of the three principal ingredients of fertilizer -- potash, nitrogen, and phosphate.

3. It has investigated the manufacture of nitrogen, particularly the fixation of the nitrogen from the air by electrical processes, and has proposed an apparatus and process for rendering garbage and other wastes.

4. It has found that the cement plants of the country might recover 70,000 tons, and possibly 100,000 tons, of actual potash every year.

5. It has erected on the Pacific Coast a plant for the recovery of potash from kelp, a giant seaweed abundant in Southern California sea coast waters.

6. (a) Considerable progress has been made in the investigation of the extraction of potash from kelp, especially with reference to the utilization of by-products which will make this process an economical success.

   (b) During the last season, the plant sold $60,000 worth of potash in the open market.

7. It has cooperated effectively with the War Department in investigating the fixation of atmospheric nitrogen for use in munitions and for fertilizer. Experiments so far carried on have resulted in the production of ammonium nitrate, valuable not only as a fertilizer, but also very largely used as a primary explosive.

8. It has perfected and demonstrated, on a commercial scale, a process for producing double acid phosphate by smelting phosphate rock and collecting in an electric precipitator the phosphoric acid produced.

9. It has devised methods for the purification of phosphoric acid with a view to its use in the manufacture of baking powder or other products used in foodstuffs.

10. It has demonstrated that phosphoric acid can be almost completely volatilized from relatively low-grade phosphates by smelting mixtures of coke and phosphates in a fuel-fed furnace. The cost details of this process are now being worked out.

11. It has investigated the use and value of raw ground phosphate rock as a fertilizer. The results of this investigation are published in a Department bulletin.

12. It successfully met the greatly increased demand for information and advice relating to soils, resulting from the home-garden campaigns of 1917 and 1918.

13. It has made studies looking to the more effective use of agricultural lime and the solution of the soil-erosion problems of the Southern States, both of which lines of work have progressed satisfactorily.

14. It has cooperated with the Bureau of Mines in the investigation of various sands as a source of a catalyzing agent which was desired by the War Department for use in connection with a process for the manufacture of explosives.

15. It has isolated the so-called "ultra clay" from the soil, determined the composition of the "ultra clay" from a number of soils, and ascertained some of its properties.

16. It has performed a large number of routine analyses for the Soil Survey, various Government bureaus, and the public generally.

17. It has given advice on various soil problems through correspondence and personal interviews.

18. It has determined the composition of the aqueous extract of a number of soils and the concentrations at which the various mineral compounds separate out when such extracts are concentrated.

19. It has found that the transformation of calcium hydroxide to carbonate and the transformation of both these compounds to calcium silicate in the soil is comparatively rapid.

BUREAU OF CROP ESTIMATES.

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1. The Bureau of Crop Estimates works through a small but efficient force of trained field agents and a corps of approximately 200,000 volunteer crop reporters throughout the country.

2. The monthly and annual crop estimates of this bureau have kept the country constantly informed regarding agricultural production. In addition to these current estimates, the bureau has estimated and reported:

   (a) Past acreages and production.

   (b) Effect of weather on crops.

   (c) Crop and live-stock losses from plant and animal diseases and insect pests.

   (d) Normal rates of consumption.

   (e) Exports and imports of various food crops.

   (f) Present and future requirements of various crops.

3. The Bureau's corps of voluntary crop reporters enables it to ascertain quickly conditions on farms with respect to

   (a) The supply of seed and labor.

   (b) Farm stocks of food and forage.

   (c) Progress of farm work.

   (d) Farm prices.

   (e) Prospective crop production.

   (f) Farm wages.

   (g) Hours of farm labor.

   (h) Fertilizer requirements.

4. In respect to some of the most important food crops, its estimates and records have proved invaluable, and this has been particularly true of the supply of sugar and cereals.

5. Its estimates have formed the basis of much of the constructive work

of the Department of Agriculture and the State agricultural colleges in stimulating crop production in time of war.

(a) The information thus furnished in the Monthly Crop Reports and the timely advice of the Department have enabled farmers to modify the relative acreages of the various staple crops, to the end that prospective shortage might be overcome, either by augmented plantings or by the increase of supplementary crops.

(b) That this was done on a huge scale is shown by the fact that the farmers of the United States planted 23 million acres more in staple food crops in 1917 than in 1916, or 32 million acres more than the average for the five years preceding the war. This great increase was almost equal to the average total acreage of cereals in Germany before the war.

6. The bureau is acquiring and systematizing the most complete collection of agricultural statistics on world's crops and live stock anywhere in existence -- a record that was particularly valuable in war time and is bound to be of immense value in the days of agricultural reconstruction following the close of the war.

7. The accuracy of the bureau's estimates has been proved repeatedly. In the case of cotton, there is an absolute check on the accuracy of the crop forcast, because the Bureau of the Census of the Department of Commerce is required by law to report the number of bales of cotton actually ginned each year. In a period of seventeen years, in which nearly 100 billion pounds of cotton were ginned, the Bureau of Crop Estimates underestimated the total by less than 1.5 per cent. For the three years 1914-16, on figures issued more than three months prior to the final ginning returns, the error in the estimates was only six-tenths of one per cent. The estimate of the rice crop for 1915, compared with the returns from all the rice mills for that year, showed an underestimate of only two-tenths of one per cent. The estimate of the wheat crop of 1918 came within 2% of receipts reported by the U. S. Grain Corporation.

8. Special activities during 1918 included:

(a) Establishment of a weekly truck crop news service.

(b) A strengthening of its field organization and the establishment of cooperative relations with State departments of agriculture with a view to improve the crop reporting service in a number of States.

(c) A number of special investigations bearing on war work which served to allay unfounded apprehension with respect to the food supply and as a guide in forming plans for the future.

(d) An increase of 50 per cent in the number of information schedules handled.

(e) Weekly reports giving field agents' comments on current crop and live-stock conditions.

(f) Semimonthly reports giving estimates of crops and live stock in foreign countries.

(g) Establishment of a monthly live-stock investigation to determine the change in the live-stock situation each month.

(h) Cooperation with State agencies, to furnish full detailed information on all crops and live stock, through joint inquiries and joint reports.

(i) Special inquiries regarding:

Quantity of different feeds given various classes of live-stock each month.

Amount of seed used per acre for all crops.

Dates of harvesting of various crops.

Maximum yield per acre of all crops.

Comparative prices paid by farmers for various articles.

Crop damage by various causes.

Varieties of spring wheat.

Monthly sales of cotton.

Monthly receipts of grain by elevators.

Length of cotton lint.

Acreage and production reports on oil-producing legumes (peanuts and soy beans).

Honey bee inquiry, honey production, and condition of colonies during honey season.

9. Considerable assistance has been rendered other bureaus and offices of the Department by conducting special investigations through the corps of voluntary crop reporters, for instance:

(a) Amount of wood consumed on the farm. Forest Service.

(b) Varieties of wheat grown in the United States - Bureau of Plant Industry.

(c) Clover inquiry - Bureau of Plant Industry.

(d) Hay variety - Bureau of Plant Industry.

(e) Corn variety - Bureau of Plant Industry.

(f) Amount of fertilizer used per acre on various crops - Fertilizer Control.

(g) General crop operations - Farm Management.

(h) Feeder and stock sheep - Farm Management.

(i) Methods of farm renting - Farm Management.

INSECTICIDE AND FUNGICIDE BOARD.

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1. The Insecticide and Fungicide Board prevents, under the Insecticide Act of 1910, the interstate shipment, importation, and manufacture and sale in the District of Columbia and the Territories, of misbranded and adulterated insecticides and fungicides.

   (a) As a result of many examinations of samples, correspondence with manufacturers, and prosecutions, farmers, fruit growers, market gardeners, and stock and poultry raisers are able to rely as never before on the claims for efficacy and strength made by manufacturers of insecticides and fungicides.

   (b) Greater reliance may also be placed on products to rid the household of insects and on disinfectants, germicides, etc., which are used to combat or kill bacteria.

   (c) The operation of the law, up to 1918, had the effect of reducing the violations in respect to lead arsenate from 60 per cent to 10 per cent, Paris green from 28 to 12 per cent, lime sulphur solution from 94 to 40 per cent and Bordeaux mixture from 98 to 28 per cent.

2. It analyzes and tests the efficacy of samples of commercial insecticides and fungicides collected by insepctors operating throughout the country; and, to obtain basic facts aiding in the enforcement of the law, makes special field and laboratory investigations and tests of substances entering into such insecticides and fungicides to determine whether or not they are active or inert for the control of the insects and fungi for which they are recommended.

3. It devises new scientific methods of analyzing insecticides.

4. It devises, in collaboration with the Bureau of Chemistry, methods of preparing new insecticides and fungicides and improving methods used in preparing known insecticides and fungicides, and publishes such work for the benefit of scientists and manufacturers.

5. It publishes Insecticide Service and Regulatory Announcements interpreting the Insecticide Act of 1910 and giving manufacturers information that will aid them in the labeling and standardization of their products.

FEDERAL HORTICULTURAL BOARD

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1. The Federal Horticultural Board regulates the entry of foreign nursery stock and other plants and plant products into the United States and promulgates and enforces domestic and foreign quarantines on account of plant diseases and insect pests. There are now in force:

   (a) Fourteen foreign quarantines relating, among others, to potato wart, corn diseases, fruit fly, white-pine blister rust, citrus canker, sugar-cane diseases, sweet-potato weevils, the pink bollworm of cotton, bamboo smut, and injurious insects and fungous diseases of nursery stock, plants, and seeds.

   (b) Eleven domestic quarantines relating, among others, to the white-pine blister rust, the Mediterranean fruit fly, the gipsy moth and brown-tail moth, the pink bollworm of cotton, sweet-potato weevils, the Japanese beetle, and the European corn borer.

   (c) Orders regulating the entry of nursery stock, cotton, potatoes, corn, and various fruits to prevent the entry with such products of important insect pests or plant diseases.

2. In connection with the outbreak of the pink bollworm discovered in Texas in 1917.

   (a) It has conducted an extensive campaign of eradication involving the destruction and clean-up of cotton in and surrounding the districts of Texas invaded by the pink bollworm.

   (b) It has cooperated with the State of Texas in the prohibition of the growth of cotton in the known infested districts in Texas, and in the maintenance of a cotton-free zone along the Mexican border.

   (c) It has established a traffic control along the Mexican border to prevent further entry of the insect from Mexico, which involves inspection and fumigation of all cars and freight entering the United States from Mexico.

   (d) It is cooperating with the Mexican Government and planters with reference to the control of the pink bollworm in Mexico.

   (e) It has established a research station in the Laguna, the principal cotton-producing section of Mexico, to determine the life history and methods of control.

3. In connection with the European corn borer, it is cooperating with the States of New York and Massachusetts, and in the case of the potato wart with the State of Pennsylvania, in steps taken to control or exterminate these pests in the areas now affected.

OFFICE OF FARM MANAGEMENT.

The work of the Office of Farm Management recently has been completely reorganized. Several months ago a committee of recognized experts in the field of farm management and farm economics was appointed by the Secretary of Agriculture to review the projects and activities of the Office, to make suggestions for the further development of the work, and to outline definite methods of procedure to be followed in the study of farm management problems, and especially the cost of producing agricultural products. The committee submitted its report which was approved by the Secretary. On the basis of this report, there was transmitted to the Congress, on May 23, 1919, a revised estimate for the work of the Office of Farm Management, the name of which it was proposed to change to "Bureau of Farm Management and Farm Economics", for the fiscal year 1920. This estimate has been printed as House Document No. 57. It called for a total appropriation of $611,990, including $96,640 for statutory salaries and $515,350

> "to investigate the cost of production of farm products, to study problems connected with farm finance, farm labor, land utilization, ownership and tenancy, and rural life conditions, and to promote improved farm organization methods."

It was estimated that the latter sum would be expended as follows:

1.	Cost of production of farm products.....	$244,690
2.	Farm organization.....	53,600
3.	Farm finance and farm relations.....	21,560
4.	Agricultural history and geography.....	29,200
5.	Land economics (land utilization).....	112,920
6.	Farm-life studies.....	20,560
7.	Demonstration activities (extension work)...	32,820
		$515,350

Unfortunately, favorable action was not taken on the proposals made in the revised estimate. The appropriations for the Office of Farm Management, therefore, during the fiscal year 1920 are approximately the same as the appropriations for the last fiscal year. Nevertheless, the new program, and especially the cost of production studies, will be prosecuted as vigorously as possible in cooperation with the agricultural colleges and experiment stations of the various States. The task of carrying out the program has been assigned to Dr. H. C. Taylor, who has been appointed Chief of the Office of Farm Management. Dr. Taylor, before accepting this position, owned and operated a farm in Wisconsin and also was the head of the Department of Agricultural Economics in the College of Agriculture of the University of Wisconsin. The services of Mr. Francis W. Peck, of the University of Minnesota, who has had wide experience in connection with studies of cost of producing farm products, have been secured to take charge, under Dr. Taylor's direction, of the

cost of production work. This is in accordance with, and a part of the plan, to secure some of the best available minds in the country to supervise and direct the important work in the field of farm management and farm economics.

The following is a summary of the activities now under way in the Office of Farm Management:

1. Cost of Production.

Cost of production studies arebeing conducted for the purpose of;

(a) Furnishing information that may enable the farmer to reduce costs, or otherwise increase profits.

(b) Giving an insight into the elements and inter-relations of the different farm activities.

(c) Recording the details of the farm business for reference.

(d) Making possible a comparison of the profitableness of the different enterprises and combination of enterprises.

(e) Providing the basic facts needed by legislators and price commissions in comparing the profits of competing lines of production and estimating necessary price.

2. Farm Organization.

(a) Work has been done upon methods of analyzing the business of the individual farm and calculating the farmer's net income.

(b) The survey method is being applied to a great variety of problems relating to farm organization and farm profit.

(c) Studies of method of determining economic size of farms in different regions are in progress.

(d) A system of farm record keeping has been worked out which has proved satisfactory on a large number of farms, and with it as a basis, the extension divisions of a number of the State Agricultural Experiment Stations have put out quantities of farm account books which are distributed to farmers through the county agents and have proved of great usefulness in providing a means of systematic farm record keeping.

(e) Studies of the conditions under which the tractor may be a part of the farm equipment and its relationship to farming operations have been made.

(f) Much has been done to popularize the larger types of labor-saving machinery and thus to increase the horse-power per man on the farm.

3. Farm Labor.

(a) In cooperation with the Department of Labor, the extension forces of the Department of Agriculture and the various State institutions have developed a plan of ascertaining the labor needs of the farmer and of supplying these needs. The Office of Farm Management has not only assisted farmers to farm a larger acreage with less help than before the war by the adoption of methods of cooperative exchange of labor, but, in cooperation with the agencies named, has been able to supply large numbers of laborers.

(b) Through the farm-help specialists in every State, campaigns were launched for forcing idlers to work, either by the influence of public opinion or through the passage of effective State laws, and also to get the people with farming experience in cities and towns to assist farmers during critical periods. Along the Mexican border, the farm-help specialists have assisted in the problem of obtaining additional laborers for work on sugar-beet and cotton plantations.

(c) After the signing of the armistice, especial attention was given to presenting possible agricultural opportunities to soldiers about to be discharged.

4. Agricultural History and Geography.

(a) The following sections of the Atlas of American Agriculture have been published: "Cotton","Frost", "Precipitation" and "Rural Population". Other sections are in press which will be of great value to all students of agriculture in this country.

5. Land Economics.

The work of the Division of Land Economics includes the following tasks:

(a) Preparation of the folios dealing with land utilization and land tenure for the Atlas of American agriculture.

(b) Specific studies of land not in use or land in improper use with the view of determining what areas can be economically used and by what methods.

(c) Studies of rental contracts with a view to determine what forms are best adapted to local conditions.

(d) Investigation of the causes, effects, and significance of tenancy and the relationship between ownership as now existing and the public welfare.

(e) Studies of land policies at home and abroad for the purpose of determining what policies are likely to establish the most efficient and satisfactory relationship of the human element to the land.

6. Farm Life Studies.

The Division of Farm Life Studies devotes its attention to the social problems of country life, including:

(a) The extent and characteristics of community organizations.

(b) Relation of educational and religious institutions to rural progress.

(c) The social aspects of tenancy, landlordism, and wage labor in rural districts.

(d) Opportunity for social contacts in rural communities.

(e) Adaptation of the farmhouse to the needs of family life.

(f) The dependent, defective, and delinquent classes of the rural community.

BUREAU OF PUBLIC ROADS

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1. The Bureau of Public Roads administers the provisions of the Federal Aid Road Act, approved July 11, 1916, which is believed to have done more for the cause of good highways than any other enterprise ever conceived in this country.

(a) The original Federal Aid Road Act appropriated out of the Federal Treasury for the construction of rural post roads the following sums:

1917.....	$ 5,000,000
1918.....	10,000,000
1919.....	15,000,000
1920.....	20,000,000
1921.....	25,000,000

as well as $1,000,000 annually for ten years for the construction of roads and trails in the National Forests.

(b) It was necessary for all the States to make appropriations or to pass enabling laws before they were in position to meet the terms of the Act and to secure its full benefits. By the time the necessary legal machinery had been created or developed by the States, the United States entered the war, and this quickly brought to a stop extensive road building operations; in fact, by the fall of 1918, highway construction was practically at a standstill on account of the difficulties of securing transportation, material, and the requisite services.

(c) Congress, at its last session, accepting the recommendations of the Department of Agriculture, incorporated in the Post Office Appropriation Act, approved February 28, 1919, some important amendments to the original Federal Aid Road Act and made available from the Federal Treasury the following additional sums for the extension and development of highway activities in cooperation with the States:

For the fiscal year 1919.....	$50,000,000
For the fiscal year 1920.....	75,000,000
For the fiscal year 1921.....	75,000,000

and the sum of $3,000,000, in addition to the

amounts included in the Federal Aid Road Act, was appropriated for each of these years for the construction of roads and trails in the National Forests. The Secretary of War also was given authority to transfer to the Secretary of Agriculture all available war material, equipment, and supplies not needed for the purposes of the War Department and suitable for use in the improvement of highways, to be distributed among the highway departments of the several States for use in connection with roads constructed in whole or in part by Federal aid. As the material, equipment, and supplies secured in this way are being distributed to the States free of charge, this action will have the effect of supplementing, in a very material way, the Federal appropriations.

(d) The amendment to the Federal Aid Road Act contained in the Post Office Appropriation Act defines a "Rural Post Road" as "any public road the major portion of which is now used, or can be used, or forms a connecting link not to exceed ten miles in length of any road or roads now or hereafter used for the transportation of the United States mails." Under the original wording of the law, Federal funds could be expended only upon roads upon which the United States mails "now are or may hereafter be transported." This required a definite determination in each case of the actual post route status of the road, which necessarily involved delays in many instances. Under the new definition, very few important roads will be debarred from receiving Federal aid if all the requirements of the Act are complied with. This feature of the original law was the most troublesome to the highway departments of the various States. Its modification will greatly lessen the difficulties of selecting and constructing new roads and will go far towards facilitating the prosecution of the work. The amendment also increased the limitation on the Federal contribution for any road from $10,000 to $20,000 per mile.

(e) On June 1, 1919, a total of 1,288 project statements had been submitted, of which 1,186 had been approved, 6 disapproved, and 47 withdrawn. The total mileage covered by these projects is 11,326.35 miles and the total estimated cost is $108,059,782.40, of which amount the States asked the Federal Government to assume payment of $42,929,483.83.

(f) A broad and comprehensive road building program has been inaugurated. This program is being vigorously pushed and the indications are that a larger volume of highway construction will be accomplished this season than in any previous year in the history of the Nation. Furthermore, the work is being done in such a way as to utilize to the best advantage the road building experience and facilities of the whole country. Under the Federal law, the State highway departments have been strengthened and developed in a way that could not be equalled under any other type of national road legislation that has been suggested. The progress that has been made in this direction is very gratifying and helpful; and the existence of an effective central highway agency in nearly every State of the Union, actively cooperating with and supported by the Department of Agriculture, makes it possible to speed up road building more rapidly than any other branch of public works. The Department maintains the closest possible touch with the State highway departments and, at its request, the American Association of State High Officials has designated some of its members, selected with due regard to geographical considerations, to serve on an advisory committee to cooperate with the Department in the administration and execution of the provisions of the Federal Aid Road Act.

2. The Bureau has built and maintained 30 miles of experimental roads in the vicinity of Washington.

3. It has furnished engineers to supervise the construction of approximately 13,000,000 square yards of object-lesson and other roads.

4. It has constructed 17 post roads, including 435 miles, under the Post Office Appropriation Act of 1912, of which the Federal Government paid one-third the cost, or a total of $500,000.

5. It has furnished engineers to make inspection and give advice on 310 projects in 41 States.

6. It has planned model highway systems in 105 counties in 25 States for use by county officials as a basis for determining the best methods of road construction and proper tax levies or bond issues for constructing the proposed system.

7. It has prepared 104 designs for bridges in 18 States, exclusive of the preparation of standard designs. It has also assigned engineers to investigate existing and proposed bridges in two States.

8. It has tested 8,167 samples of road material, of which 2,767 were chemical and 5,400 were physical, samples having been tested from every State.

9. It has conducted various other forms of research and educational work in connection with road and bridge building.

10. It has conducted, since January 1, 1917, the engineering and construction work in connection with most of the highways in the National Forests.

(In July, 1914, all activities of the Department involving rural engineering problems were placed under the Bureau of Public Roads and, at the same time, the irrigation and drainage investigations of the Department were transferred to it. The principal activities along these lines since July, 1914, were as follows:)

11. It has prepared 120 standard designs for farm structures of various kinds, and designed 79 pieces of work for other bureaus, including apparatus and buildings, costing from $100 to $75,000.

12. It has prepared plans and given advice in connection with 66 water supply and sewage disposal systems, 4 refrigerating plants, 8 heating plants, 3 plumbing and sanitary drainage systems and 5 lighting and power plants.

13. It has designed a variety of mechanisms for farm appliances, on several of which public patents have been granted.

14. It has aided in the establishment of thrasher schools in grain growing sections to instruct thrashermen and farmers in operating rigs so as to eliminate the tremendous loss of grain due to inefficient machinery and methods.

15. It has made recommendations which were adopted as the basis of pronounced modifications in the standardization of farm wagons of the Wagon Manufacturers' Association.

16. It has given aid to a large number of drainage districts, has assisted in the drafting of a number of State drainage laws, and has promoted the use of tile drains in many localities.

17. It has introduced better methods on 15,000,000 acres of irrigated land, designed measuring devices, aided in the passage of better irrigation laws, made plans for drainage of 375,000 acres of irrigated lands, and advised in the remodeling of many irrigation systems to effect complete utilization of the water supply of valleys.

(After the beginning of the war, the bureau established cooperative relations with a number of Government agencies, in order to deal more effectively with the work of highway construction and maintenance and other engineering problems as affected by war conditions.)

18. It arranged with the Fuel Administration for passing upon applications for approval of highway projects involving the use of oils, tars, and asphalts.

19. It cooperated with the Railroad Administration in passing upon the necessity for highway construction and maintenance involving the use of open-top cars over and above the supply locally available.

20. It cooperated with the War Industries Board in applying the Government price of cement to Federal-aid roads and in handling questions of priority as affecting structural and reinforcing metal and other materials entering into highway work.

21. It cooperated with the Capital Issues Committee in reporting upon highway bond issues involving an outlay of $100,000 or more.

22. It cooperated with the War Department by assigning an engineer to each of the 16 army cantonments for highway work, supervising the construction of a number of roads leading to cantonments and posts, conducting map work, and devising equipment to determine the power of high explosives, etc.

23. It cooperated with the Shipping Board in tests and design in connection with the construction of concrete ships and in dealing with the housing of ship workers.

24. It organized the United States Highways Council, composed of one member each from the War Department, the Department of Agriculture, the Railroad Administration, the Fuel Administration, and the War Industries Board. This council coordinated the work of the respective Government agencies in relation to highways, under the chairmanship of the Director of the Bureau of Public Roads.

FOREST SERVICE

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1. The Department of Agriculture has stood unflinchingly for the continued Federal control of the great National Forests and for their efficient and economical administration and protection. As public properties they are now serving both the general and local welfare more satisfactorily than ever before.

2. Notable achievements have marked the six-year period since 1913.

   (a) The National Forest enterprise has gained greatly in in permanence.

   (b) The present usefulness of the Forests has been materially developed.

   (c) Their productive capacity has been not merely safeguarded but increased.

   (d) Their cash returns to the Government have become 65 per cent greater.

   (e) Regulated development of the great water-power resources has been guided along lines fair to the investor and at the same time protective of the interests of the consuming public.

   (f) The cost of administration, in proportion to the volume of business, has been reduced.

   (g) The control of forest fires has become much more effective.

3. As a result of the systematic and scientific working out of foresighted methods of handling the forest resources, and as a result of accumulated knowledge of the industries which derive material from the forests and of the basic problems involved in production, the Department of Agriculture was ready at the outbreak of the war to contribute materially to increased production of meat, wool, and hides through more intensive use of the National Forest ranges and to render important services to the army and navy in matters connected with munitions production, shipbuilding, airplane construction, and many other matters.

4. The National Forest enterprise has been given greater permanence through constructive administration, through wider public approval in consequence of efficient handling of the public business, and through the securing of constructive legislation.

(a) Important court decisions have established the basic soundness of the conceptions which have underlain the plans for development.

(b) Lands suitable for agriculture included within the National Forests have been sought out, segregated, and opened to settlement.

(c) The portions of the forests not suitable for permanent ownership and administration by the Government for the growing of timber, the protection of stream flow, and other forest uses have likewise been segregated and restored to the public domain.

(d) Roads, trails, and other improvements facilitating use have been constructed.

(e) Community development has been promoted.

(f) The building up of eastern forests through the purchase of lands in the southern Appalachian and White Mountain regions has been notably advanced.

5. Other facts pointing to the increased usefulness of the forests are:

(a) In 1912 the number of timber sales made from the National Forests was 5,772; in 1918, 13,037.

(b) The cut of timber in 1912 was 554,725,000 board feet; in 1918, 827,199,000 board feet.

(c) In 1912 there were grazed, on a National Forest area of 165,000,000 acres, 9,054,437 head of domestic live stock covered by paid permits issued to 26,501 users; in 1918 there were grazed, on a National Forest area of 155,000,000 acres, 10,755,589 head of stock covered by paid permits issued to 39,113 users.

(d) There has been a consistent increase in the use of National Forest timber for local industries and requirements of all kinds. This use, served mainly through small and medium-sized sales, requires about 12 per cent of the annual yield of the Forests.

(e) The number of live stock grazed free by local settlers has been increased materially.

(f) These figures show increased participation in commercial use of the Forests by small users, as well as a larger volume of use.

(g) A great advance was also made in the number of users of the forests for recreation purposes and in the constructive development of the recreation resource of the forests -- destined to be of incalculable public value.

(h) The total receipts from the National Forests in 1912 were a little over $2,100,000; in 1919 they were $4,358,414.86.

(i) The National Forests are now nearly paying their operating expenses.

6. Cooperative assistance to the States in fire protection and in the solving of their forestry problems has shown a steady increase. In 1912 the number of States receiving assistance in fire protection was 15; in 1919, 23.

7. In the field of industrial research the Forest Service is doing work of fundamental character and inestimable importance to the country. The Forest Products Laboratory leads the world in organization and equipment for advancing knowledge along lines that contribute to national efficiency in the industries deriving their raw material from the forests.

(a) It has shown how to secure greater yields, lessen waste, and use material to better advantage, in ways too numerous to be briefly enumerated.

(b) In actual money outlay its studies have meant a saving during the war period to the Government alone of sums that run into the millions. The saving to the industries of the country through the adaptation of the results of these studies to commercial practice already bids fair to be of tremendous importance.

8. The war found the Forest Service personnel ready for many forms of service. A great many of its members went overseas with the Tenth and Twentieth Engineers, forestry regiments, which the Forest Service helped the War Department to organize, and in other army units.

9. During the past year the necessity of extending the practice of forestry much more completely to privately owned timberlands has become apparent. Determining the means by which this is to be accomplished and collecting the information necessary for the proper carrying out of the task has now become one of the major duties of the Forest Service.

WEATHER BUREAU

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1. The Weather Bureau has conducted its work wholly in the interest of agriculture, commerce, and navigation, and has planned its research work with a view to improve its service to these three important interests. The work of the bureau may be classified broadly as follows:

   (a) Weather forecasts and warnings.

   (b) River and flood service.

   (c) Climatological service.

   (d) Agricultural meteorology.

   (e) Aerology, in aid of aviation.

2. Distribution of daily forecasts, its principal and most important function, has been continued and extended so that at present, within two hours after the morning observations have been taken, forecasts are telegraphed from the forecast centers to about 1700 principal distributing points, whence they are further disseminated by telephone and mail, reaching nearly 100,000 addresses daily by mail and being made available to more than 5,000,000 telephone subscribers within approximately an hour after the time of issue; this in addition to the distribution effected through the press associations and the daily newspapers.

3. Its special weather warning service, designed to give farmers, fruit and truck growers, foresters, and stock raisers sufficient notice of the approach of dangerous weather conditions to enable them to protect their products, has been greatly extended and made more efficient.

4. Its equipment for the dissemination of storm warnings at night has been improved.

5. It has aided in the protection of life and property at sea and along the coast by special arrangement for the early detection of storms, especially in the Caribbean Sea, and by a widespread distribution of warnings of tropical hurricanes to the regions threatened.

6. Its service has been made particularly valuable to mariners through the cooperation of the Naval Radio Service, which now distributes daily to ships at sea and on the Great Lakes weather information, forecasts, and storm warnings. This service has been extended to the Caribbean Sea and to the Panama Canal Zone.

7. It has cooperated with the War Department, both in this country and in Europe, in furnishing information as to weather and upper-air conditions for use by the aviation and artillery services during the period of the war. It has established five additional aerological stations for the observation, measurement, and investigation of atmospheric phenomena in the aid of aeronautics.

8. Through its river and flood service, which is organized with its principal headquarters at Washington, D. C., and subsidiary district centers, about sixty in number, throughout the country, it has collected by telegraph and telephone data of precipitation and gauge readings from about 450 stations on which are based daily forecasts of rise and fall, stages during the low-water season, and warnings of dangerous floods in the respective rivers.

9. Through its climatological service it has secured daily observations of temperature and rainfall from about 4,500 cooperative stations, representing all sections of the country, and published the data separately by States in the form of monthly reports that are given wide distribution.

10. It has collected and disseminated information relative to the effect of weather and climate upon crops, and during the crop-growing season, namely, April to September, inclusive, each section center receives by mail reports from numerous correspondents concerning the effects of the weather upon crops and farm operations and issues weekly bulletins containing the data thus obtained. During the same season the central office at Washington issues weekly a National Weather and Crop Bulletin containing a series of charts graphically illustrating the current and normal conditions of temperature and rainfall throughout the country, a general summary of the effects of the conditions on the staple crops, and a brief report of the conditions on the crops in the respective States. Throughout the cotton, corn, wheat, sugar, and rice-producing sections, designated centers have received and published in bulletin form telegraphic reports of rainfall and daily extremes of temperature.

11. During the season of 1918, it aided in dealing with the farm-labor problem by publishing in its weekly crop bulletins charts which showed where the harvesting of the various crops had begun and where the crops would be ready for harvest one or two weeks in advance. This information was obtained by telegraph and forwarded promptly to the Office of Farm Management, where it was used in anticipating labor needs in different parts of the country.

12. It cooperated with the Navy Department in connection with the trans-Atlantic flight by airplanes in May, 1919, by furnishing the Naval bases such meteorological reports received by the

bureau as were desired and by issuing forecasts of conditions expected to occur over the routes of the planes. A meteorological expert was assigned to the naval base at Trepassey, Newfoundland, to interpret the reports, amplify the forecasts, and otherwise assist the aviators with advice.

13. The Bureau inaugurated a "Highway Weather Service", consisting of reports showing the state of the roads as affected by weather conditions and giving forecasts of weather conditions affecting travel over the roads. Projects now are in operation in eleven States.

PUBLICATION AND INFORMATIONAL WORK OF THE DEPARTMENT

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1. Realizing that information of great value to the people was being gathered by the Department's specialists more rapidly than it was being circulated, steps were taken in May, 1913, to develop means, aside from the extension machinery, of making this information available more promptly and in popular, understandable form. This was undertaken through

   (a) A new classification of publications.

   (b) The establishment of the Office of Information.

2. By the new classification of publications a sharp line has been drawn between the strictly scientific and the popular bulletins with a view to present the two kinds of information more effectively to those for whom it is intended and to prevent the waste arising from a miscellaneous distribution of the scientific bulletin. The confusion which had existed as the result of multiplicity of series of publications was eliminated so that instead of having no less than forty different series, there are at present only five general classes, namely

   (a) Farmers' Bulletins, popularly written and designed to give specific directions for doing things.

   (b) Department Bulletins, carrying semi-technical results of investigations.

   (c) Department Circulars, giving results of investigation and miscellaneous reports in brief form as occasion demands.

   (d) The serial publications, including the Journal of Agricultural Research, the Experiment Station Record, and the Weekly News Letter.

   (e) Annual reports and other congressional publications, including the Yearbook and soil surveys.

3. During the six years ending July 1, 1919, approximately 360,000,000 copies of publications carrying messages of better farming and better home life were distributed by the Department. To stimulate production and conservation this work has been greatly enlarged in

the last two years with the result that approximately 200,000,000 copies of the publications were distributed in the year ending June 30, 1919.

4. Through the Office of Information the Department makes prompt distribution to the press of discoveries and advice. The Department has studied the needs of the press by conferences with editors and through detailed questionnaires sent to them. The informational news services, several of which were inaugurated during the war to stimulate food production and food saving, and since revised to meet the immediate needs, are as follows:

(a) The Weekly News Letter which is sent to some 20,000 publications and to Federal and State agricultural workers and cooperators.

(b) The Plate Service in which the advice of the Department's specialists is furnished through a plate manufacturing concern to a large proportion of the 12,000 or more country weeklies and to the small dailies.

(c) The Special Information Service, an illustrated weekly news syndicate under four departments of two columns each, discussing problems of food production and conservation. Now furnished on request to more than 3,000 afternoon dailies and weeklies in addition to many smaller papers which obtain it from plate-making concerns in plate form.

(d) The mimeographed News Service furnished daily or as the necessity for prompt distribution demands to newspapers, agricultural journals and specialized publications -- generally or locally.

(e) Circulars, posters and other advertising matter to aid in special educational campaigns.

(f) Seasonal illustrated news series such as the Home Garden Series and the Canning-Drying Series, which are calculated to aid in the Department's special campaigns of one sort or another.

(g) A weekly news review under the head "Food and Farming Weekly" through which newspapers and agricultural journals are advised week by week of results obtained and progress by the Department's forces.

Exhibits

The Department of Agriculture was the first executive department to establish an Office of Exhibits. The purpose was to centralize the administration of the exposition services of the department and to secure uniformity of practice in designing and displaying its educational exhibits. During the fiscal year 1918, the work developed along lines of stimulating food production and conservation. Over 30 exhibitions were made, extending from New England to Florida and California. The demand from fair associations and similar organizations was so great that it could not be fully met. On the initiative of the Department of Agriculture, war exhibits were arranged jointly by the Departments of Agriculture, War, Navy, Interior, and Commerce, and shown at 37 State and other large fairs and expositions. The expert on exhibits of the Department of Agriculture was chairman of the joint committee.

During 1919, the Department of Agriculture sent out five complete sets of exhibits to forty of the large State and interstate fairs. Each set covered from five to eight fairs and represented a wider variety of material than was shown in previous years. The exhibits were not combined with those of other departments as was the case in 1918. Twelve bureaus and divisions were represented and, in general, the material was displayed to better advantage because of its new and unique design. Under a special appropriation recently passed by Congress, the exhibit work is to be even further enlarged during 1920.

Motion Picture Activities

The dissemination of information by motion pictures, which had been conducted only on an experimental basis prior to 1918, has been developed as a systematic activity. Films prepared by the department have been used effectively in recruiting farm labor, encouraging preservation of fruits and vegetables, preventing forest fires, stimulating agricultural production, etc. Through department agencies and with the cooperation of one of the commercial companies, they were shown to approximately 4,500,000 people during the fiscal year 1918.

During the fiscal year 1919, 22 reels of film were made, covering 17 subjects of wide importance. Films are in process of making on 14 other subjects, and 10 new projects are under way. The films are lent, the borrower being required only to pay transportation charges, through the extension workers of the department and officially cooperating institutions. They must be used by the cooperating agencies of the department for educational purposes and must not be applied to any sort of commercial use. The number of copies that the department is able to supply is inadequate to meet the demand.

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